Manhasset High School
AP World History
Summer Assignment 2024-25
Direct inquiries to zachary_kelly@manhassetschools.org

30 point assignment due Thursday, September 5: Read the attached excerpts from Charles C. Mann's *1493: Uncovering the New World Columbus Created*.

Then complete the three charts below. These three charts are based on the three historical reasoning practices that are used in essays created by the College Board: comparison, continuity and change over time, and causation.

Chart 1: Compare and contrast the impacts of the Columbian Exchange on people in two regions.

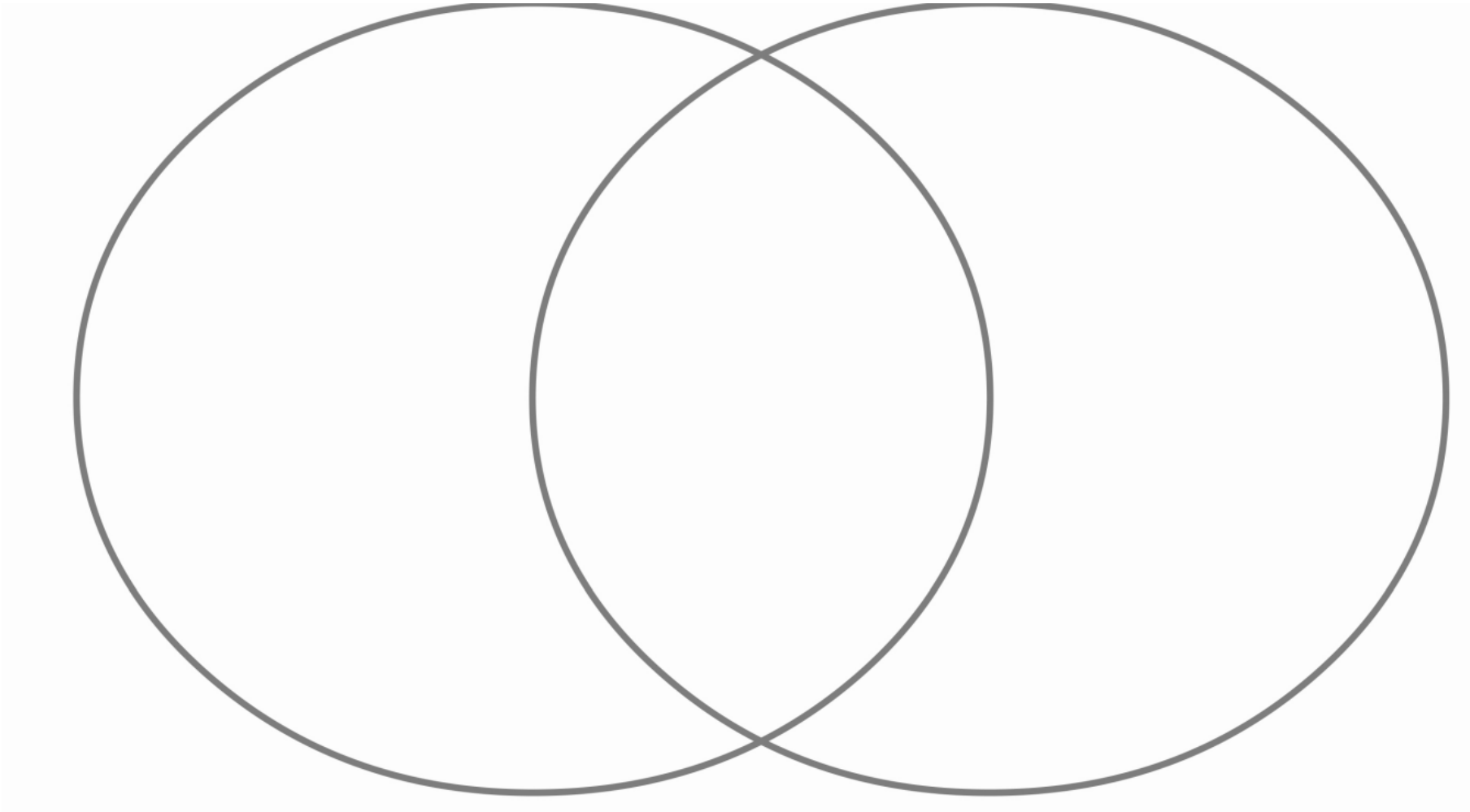


Chart 2: For one or more regions, or for the world as a whole, describe continuities and changes associated with the Columbian Exchange. This chart will require you to incorporate knowledge from the 9th grade curriculum.

The Columbian Exchange:

Continuity	**Change Over Time**

Chart 3: Complete the cause and effect chart below.

Causes of Columbus' First Voyage	Columbus' First Voyage (leave this blank)	Effects of the Columbian Exchange
	1 4 9 2	

INTRODUCTION

In the Homogenocene

1

Two Monuments

THE SEAMS OF PANGAEA

Although it had just finished raining, the air was hot and close. Nobody else was in sight; the only sound other than those from insects and gulls was the staticky low crashing of Caribbean waves. Around me on the sparsely covered red soil was a scatter of rectangles laid out by lines of stones: the outlines of now-vanished buildings, revealed by archaeologists. Cement pathways, steaming faintly from the rain, ran between them. One of the buildings had more imposing walls than the others. The researchers had covered it with a new roof, the only structure they had chosen to protect from the rain. Standing like a sentry by its entrance was a hand-lettered sign: *Casa Almirante*, Admiral's House. It marked the first American residence of Christopher Columbus, Admiral of the Ocean Sea, the man whom generations of schoolchildren have learned to call the discoverer of the New World.

La Isabela, as this community was called, is situated on the north side of the great Caribbean island of Hispaniola, in what is now the Dominican Republic. It was the initial attempt by Europeans to make a permanent base in the Americas. (To be precise, La Isabela marked the beginning of *consequential* European settlement—Vikings had established a short-lived village in Newfoundland five centuries

before.) The admiral laid out his new domain at the confluence of two small, fast-rushing rivers: a fortified center on the north bank, a satellite community of farms on the south bank. For his home, Columbus—Cristóbal Colón, to give him the name he answered to at the time—chose the best location in town: a rocky promontory in the northern settlement, right at the water's edge. His house was situated perfectly to catch the afternoon light.

Lines of stones mark the outlines of now-vanished buildings at La Isabela, Christopher Columbus's first attempt to establish a permanent base in the Americas. (Illustration credit fm1.1)

Today La Isabela is almost forgotten. Sometimes a similar fate appears to threaten its founder. Colón is by no means absent from history textbooks, of course, but in them he seems ever less admirable and important. He was a cruel, deluded man, today's critics say, who stumbled upon the Caribbean by luck. An agent of imperialism, he was in every way a calamity for the Americas' first inhabitants. Yet a different but equally contemporary perspective suggests that we should continue to take notice of the admiral. Of all the members of humankind who have ever walked the earth, he alone inaugurated a new era in the history of life.

The king and queen of Spain, Fernando (Ferdinand) II and Isabel I, backed Colón's first voyage grudgingly. Transoceanic travel in those days was heart-stoppingly expensive and risky—the equivalent, perhaps, of space-shuttle flights today. Despite relentless pestering, Colón was able to talk the monarchs into supporting his scheme only by threatening to take the project to France. He was riding to the frontier, a friend wrote later, when the queen "sent a court bailiff posthaste" to fetch him back. The story is probably exaggerated. Still, it is clear that the sovereigns' reservations drove the admiral to whittle down his expedition, if not his ambitions, to a minimum: three small ships (the biggest may have been less than sixty feet long), a combined crew of about ninety. Colón himself had to contribute a quarter of the budget, according to a collaborator, probably by borrowing it from Italian merchants.

Everything changed with his triumphant return in March of 1493, bearing golden ornaments, brilliantly colored parrots, and as many as ten captive Indians. The king and queen, now enthusiastic, dispatched Colón just six months later on a second, vastly larger expedition: seventeen ships, a combined crew of perhaps fifteen hundred, among them a dozen or more priests charged with bringing the faith to these new lands. Because the admiral believed he had found a route to Asia, he was sure that China and Japan—and all their opulent goods—were only a short journey beyond. The goal of this second expedition was to create a permanent bastion for Spain in the heart of Asia, a headquarters for further exploration and trade.

The new colony, predicted one of its founders, "will be widely renowned for its many inhabitants, its elaborate buildings, and its magnificent walls." Instead La Isabela was a catastrophe, abandoned barely five years after its creation. Over time its structures vanished, their very stones stripped to build other, more successful towns. When a U.S.–Venezuelan archaeological team began excavating the site in the late 1980s, the inhabitants of La Isabela were so few that the scientists were able to move the entire settlement to a nearby hillside. Today it has a couple of roadside fish restaurants, a single, failing hotel, and a little-visited museum. On the edge of town, a church, built in 1994 but already showing signs of age, commemorates the first Catholic Mass celebrated in the Americas. Watching the waves from the admiral's ruined home, I could easily imagine disappointed tourists thinking that the colony had left nothing meaningful behind—that there was no reason, aside from the pretty beach, for anyone to pay attention to La Isabela. But that would be a mistake.

Babies born on the day the admiral founded La Isabela—January 2, 1494—came into a world in which direct trade and communication between western Europe and East Asia were largely blocked by the Islamic nations between (and their partners in Venice and Genoa), sub-Saharan Africa had little contact with Europe and next to none with South and East Asia, and the Eastern and Western hemispheres were almost entirely ignorant of each other's very existence. By the time those babies had grandchildren, slaves from Africa mined silver in the Americas for sale to China; Spanish merchants waited impatiently for the latest shipments of Asian silk and porcelain from Mexico; and Dutch sailors traded cowry shells from the Maldive Islands, in the Indian Ocean, for human beings in Angola, on the coast of the Atlantic. Tobacco from the Caribbean ensorcelled the wealthy and powerful in Madrid, Madras, Mecca, and Manila. Group smoke-ins by violent young men in Edo (Tokyo) would soon lead to the formation of two rival gangs, the Bramble Club and the Leather-breeches Club. The shogun jailed seventy of their members, then banned smoking.

Long-distance trade had occurred for more than a thousand years, much of it across the Indian Ocean. China had for centuries sent silk to the Mediterranean by the Silk Road, a route that was lengthy, dangerous, and, for those who survived, hugely profitable. But nothing like this worldwide exchange had existed before, still less sprung up so quickly, or functioned so continuously. No previous trade networks included both of the globe's two hemispheres; nor had they operated on a scale large enough to disrupt societies on opposite sides of the planet. By founding La Isabela, Colón initiated permanent European occupation in the Americas. And in so doing he began the era of *globalization*—the single, turbulent exchange of goods and services that today engulfs the entire habitable world.

Newspapers usually describe globalization in purely economic terms, but it is also a biological phenomenon; indeed, from a long-term perspective it may be *primarily* a biological phenomenon. Two hundred and fifty million years ago the world contained a single landmass known to scientists as Pangaea. Geological forces broke up this vast expanse, splitting Eurasia and the Americas. Over time the two divided halves of Pangaea developed wildly different suites of plants and animals. Before Colón a few venturesome land creatures had crossed the oceans and established themselves on the other side. Most were insects and birds, as one would expect, but the list also includes, surprisingly, a few farm species—bottle gourds, coconuts, sweet potatoes—the subject today of scholarly head-scratching. Otherwise, the world was sliced into separate ecological domains. Colón's signal accomplishment was, in the phrase of historian Alfred W. Crosby, to reknit the seams of Pangaea. After 1492 the world's ecosystems collided and mixed as European vessels carried thousands of species to new homes across the oceans. The Columbian Exchange, as Crosby called it, is the reason there are tomatoes in Italy, oranges in the United States, chocolates in Switzerland, and chili peppers in Thailand. To ecologists, the Columbian Exchange is arguably the most important event since the death of the dinosaurs.

Unsurprisingly, this vast biological upheaval had repercussions on humankind. Crosby argued that the Columbian Exchange underlies much of the history we learn in the classroom—it was like an invisible wave, sweeping along kings and queens, peasants and priests, all unknowing. The claim was controversial; indeed, Crosby's manuscript, rejected by every major academic publisher, ended up being published by such a tiny press that he once joked to me that his book had been distributed "by tossing it on the street, and hoping readers happened on it." But over the decades since he coined the term, a growing number of researchers have come to believe that the ecological paroxysm set off by Colón's voyages—as much as the economic convulsion he began—was one of the establishing events of the modern world.

On Christmas Day, 1492, Colón's first voyage came to an abrupt end when his flagship, the *Santa María*, ran aground off the northern coast of Hispaniola. Because his two remaining vessels, the *Niña* and *Pinta*, were too small to hold the entire crew, he was forced to leave thirty-eight men behind. Colón departed for Spain while those men were building an encampment—a scatter of makeshift huts surrounded by a crude palisade, adjacent to a larger native village. The encampment was called La Navidad (Christmas), after the day of its involuntary creation (its precise location is not known today). Hispaniola's native people have come to be known as the Taino. The conjoined Spanish-Taino settlement of La Navidad was the intended destination of Colón's second voyage. He arrived there in triumph, the head of a flotilla, his crewmen swarming the shrouds in their eagerness to see the new land, on November 28, 1493, eleven months after he had left his men behind.

(Map credit Map1.1)

He found only ruin; both settlements, Spanish and Taino, had been razed. "We saw everything burned and the clothing of Christians lying on the weeds," the ship's doctor wrote. Nearby Taino showed the visitors the bodies of eleven Spaniards,

"covered by the vegetation that had grown over them." The Indians said that the sailors had angered their neighbors by raping some women and murdering some men. In the midst of the conflict a second Taino group had swooped down and overwhelmed both sides. After nine days of fruitless search for survivors Colón left to find a more promising spot for his base. Struggling against contrary winds, the fleet took almost a month to crawl a hundred miles east along the coast. On January 2, 1494, Colón arrived at the shallow bay where he would found La Isabela.

Almost immediately the colonists ran short of food and, worse, water. In a sign of his inadequacy as an administrator, the admiral had failed to inspect the water casks he had ordered; they, predictably, leaked. Ignoring all complaints of hunger and thirst, the admiral decreed that his men would clear and plant vegetable patches, erect a two-story fortress, and enclose the main, northern half of the new enclave within high stone walls. Inside the walls the Spaniards built perhaps two hundred houses, "small like the huts we use for bird hunting and roofed with weeds," one man complained.*

Most of the new arrivals viewed these labors as a waste of time. Few actually wanted to set up shop in La Isabela, still less till its soil. Instead they regarded the colony as a temporary base camp for the quest for riches, especially gold. Colón himself was ambivalent. On the one hand, he was supposed to be governing a colony that was establishing a commercial entrepôt in the Americas. On the other hand, he was supposed to be at sea, continuing his search for China. The two roles conflicted, and Colón was never able to resolve the conflict.

On April 24 Colón sailed off to find China. Before leaving, he ordered his military commander, Pedro Margarit, to lead four hundred men into the rugged interior to seek Indian gold mines. After finding only trivial quantities of gold—and not much food—in the mountains, Margarit's charges, tattered and starving, came back to La Isabela, only to discover that the colony, too, had little to eat—those left behind, resentful, had refused to tend gardens. The irate Margarit hijacked three ships and fled to Spain, promising to brand the entire enterprise as a waste of time and money. Left behind with no food, the remaining colonists took to raiding Taino storehouses. Infuriated, the Indians struck back, setting off a chaotic war. This was the situation that confronted Colón when he returned to La Isabela five months after his departure, dreadfully sick and having failed to reach China.

A loose alliance of four Taino groups faced off against the Spaniards and one Taino group that had thrown its lot in with the foreigners. The Taino, who had no metal, could not withstand assaults with steel weapons. But they made the fight costly for the Spaniards. In an early form of chemical warfare, the Indians threw gourds stuffed with ashes and ground hot peppers at their attackers, unleashing clouds of choking, blinding smoke. Protective bandannas over their faces, they charged through the tear gas, killing Spaniards. The intent was to push out the foreigners—an unthinkable course to Colón, who had staked everything on the voyage. When the Spaniards counterattacked, the Taino retreated scorched-earth style, destroying their own homes and gardens in the belief, Colón wrote scornfully, "that hunger would drive us from the land." Neither side could win. The Taino alliance could not eject the Spaniards from Hispaniola. But the Spaniards were waging war on the people who provided their food supply; total victory would be a total disaster. They won skirmish after skirmish, killing countless natives. Meanwhile, starvation, sickness, and exhaustion filled the cemetery in La Isabela.

Humiliated by the calamity, the admiral set off for Spain on March 10, 1496, to beg the king and queen for more money and supplies. When he returned two years later—the third of what would become four voyages across the Atlantic—so little was left of La Isabela that he landed on the opposite side of the island, in Santo Domingo, a new settlement founded by his brother Bartolomé, whom he had left behind. Colón never again set foot in his first colony and it was almost forgotten.

Despite the brevity of its existence, La Isabela marked the beginning of an enormous change: the creation of the modern Caribbean landscape. Colón and his crew did not voyage alone. They were accompanied by a menagerie of insects, plants, mammals, and microorganisms. Beginning with La Isabela, European

expeditions brought cattle, sheep, and horses, along with crops like sugarcane (originally from New Guinea), wheat (from the Middle East), bananas (from Africa), and coffee (also from Africa). Equally important, creatures the colonists knew nothing about hitchhiked along for the ride. Earthworms, mosquitoes, and cockroaches; honeybees, dandelions, and African grasses; rats of every description—all of them poured from the hulls of Colón's vessels and those that followed, rushing like eager tourists into lands that had never seen their like before.

Cattle and sheep ground American vegetation between their flat teeth, preventing the regrowth of native shrubs and trees. Beneath their hooves would sprout grasses from Africa, possibly introduced from slave-ship bedding; splay-leaved and dense on the ground, they choked out native vegetation. (Alien grasses could withstand grazing better than Caribbean groundcover plants because grasses grow from the base of the leaf, unlike most other species, which grow from the tip. Grazing consumes the growth zones of the latter but has little impact on those in the former.) Over the years forests of Caribbean palm, mahogany, and ceiba became forests of Australian acacia, Ethiopian shrubs, and Central American logwood. Scurrying below, mongooses from India eagerly drove Dominican snakes toward extinction. The change continues to this day. Orange groves, introduced to Hispaniola from Spain, have recently begun to fall to the depredations of lime swallowtail butterflies, citrus pests from Southeast Asia that probably came over in 2004. Today Hispaniola has only small fragments of its original forest.

Natives and newcomers interacted in unexpected ways, creating biological bedlam. When Spanish colonists imported African plantains in 1516, the Harvard entomologist Edward O. Wilson has proposed, they also imported scale insects, small creatures with tough, waxy coats that suck the juices from plant roots and stems. About a dozen banana-infesting scale insects are known in Africa. In Hispaniola, Wilson argued, these insects had no natural enemies. In consequence, their numbers must have exploded—a phenomenon known to science as "ecological release." The spread of scale insects would have dismayed the island's European banana farmers but delighted one of its native species: the tropical fire ant *Solenopsis geminata*.* *S. geminata* is fond of dining on scale insects' sugary excrement; to ensure the flow, the ants will attack anything that disturbs them. A big increase in scale insects would have led to a big increase in fire ants.

So far this is informed speculation. What happened in 1518 and 1519 is not. In those years, according to Bartolomé de Las Casas, a missionary priest who lived through the incident, Spanish orange, pomegranate, and cassia plantations were destroyed "from the root up." Thousands of acres of orchards were "all scorched and dried out, as though flames had fallen from the sky and burned them." The actual culprit, Wilson argued, was the sap-sucking scale insects. But what the Spaniards *saw* was *S. geminata*—"an infinite number of ants," Las Casas reported, their stings causing "greater pains than wasps that bite and hurt men." The hordes of ants swarmed through houses, blackening roofs "as if they had been sprayed with charcoal dust," covering floors in such numbers that colonists could sleep only by placing the legs of their beds in bowls of water. They "could not be stopped in any way nor by any human means."

Overwhelmed and terrified, Spaniards abandoned their homes to the insects. Santo Domingo was "depopulated," one witness recalled. In a solemn ceremony, the remaining colonists chose, by lottery, a saint to intercede with God on their behalf—St. Saturninus, a third-century martyr. They held a procession and feast in his honor. The response was positive. "From that day onward," Las Casas wrote, "one saw by plain sight that the plague began to diminish."

From the human perspective, the most dramatic impact of the Columbian Exchange was on humankind itself. Spanish accounts suggest that Hispaniola had a large native population: Colón, for instance, casually described the Taino as "innumerable, for I believe there to be millions upon millions of them." Las Casas claimed the population to be "more than three million." Modern researchers have not nailed down the number; estimates range from 60,000 to almost 8 million. A careful study in 2003 argued that the true figure was "a few hundred thousand." No

matter what the original number, though, the European impact was horrific. In 1514, twenty-two years after Colón's first voyage, the Spanish government counted up the Indians on Hispaniola for the purpose of allocating them among colonists as laborers. Census agents fanned across the island but found only 26,000 Taino. Thirty-four years later, according to one scholarly Spanish resident, fewer than 500 Taino were alive. The destruction of the Taino plunged Santo Domingo into poverty. The colonists had wiped out their own labor force.

Spanish cruelty played its part in the calamity, but its larger cause was the Columbian Exchange. Before Colón none of the epidemic diseases common in Europe and Asia existed in the Americas. The viruses that cause smallpox, influenza, hepatitis, measles, encephalitis, and viral pneumonia; the bacteria that cause tuberculosis, diphtheria, cholera, typhus, scarlet fever, and bacterial meningitis—by a quirk of evolutionary history, all were unknown in the Western Hemisphere. Shipped across the ocean from Europe these maladies consumed Hispaniola's native population with stunning rapacity. The first recorded epidemic, perhaps due to swine flu, was in 1493. Smallpox entered, terribly, in 1518; it spread to Mexico, swept down Central America, and then continued into Peru, Bolivia, and Chile. Following it came the rest, a pathogenic cavalcade.

Throughout the sixteenth and seventeenth centuries novel microorganisms spread across the Americas, ricocheting from victim to victim, killing three-quarters or more of the people in the hemisphere. It was as if the suffering these diseases had caused in Eurasia over the past millennia were concentrated into a span of decades. In the annals of human history there is no comparable demographic catastrophe. The Taino were removed from the face of the earth, though recent research hints that their DNA may survive, invisibly, in Dominicans who have African or European features, genetic strands from different continents entangled, coded legacies of the Columbian Exchange.

TO THE LIGHTHOUSE

A placid, whispering river runs through Santo Domingo, capital of the Dominican Republic. On the west bank of the river stands the stony remains of the colonial town, including the palace of Diego Colón, the admiral's firstborn son. From the east bank rises a vast mesa of stained concrete, a monolith 102 feet high and 689 feet long. It is the Faro a Colón—the Columbus Lighthouse. The structure is called a lighthouse because 146 four-kilowatt lights are mounted on its summit. They point straight up, assaulting the heavens with a fusillade of light intense enough to cause blackouts in surrounding neighborhoods.

Like a medieval church, the lighthouse is laid out as a cross, with a long nave and two short transepts projecting from the sides. At the central intersection, inside a crystal security box, is an ornate golden sarcophagus said to contain the admiral's bones. (The claim is disputed; in Seville, Spain, another ornate sarcophagus also is said to house Colón's remains.) Beyond the sarcophagus are a series of exhibits from many nations. When I visited not long ago, most focused on the hemisphere's original inhabitants, depicting them as the passive or even grateful recipients of European largesse, cultural and technological.

Unsurprisingly, native people rarely endorse this view of their history, and Colón's part in it. An army of activists and scholars has bombarded the public with condemnations of the man and his works. They have called him brutal (he was, by today's standards) and racist (he wasn't, strictly speaking—modern concepts of race had not yet been invented); incompetent as an administrator (he was) and as a seaman (he wasn't); a religious fanatic (he surely was, from a secular point of view); and a greedy monomaniac (a charge, the admiral's supporters would say, that could be leveled against all ambitious souls). Colón, his detractors charge, never understood what he had found.

Completed in 1992, this huge, cross-shaped memorial to Columbus in Santo Domingo was designed by the young Scottish architect Joseph Lea Gleave, who attempted to capture in stone what he regarded as Columbus's most important role: the man who brought Christianity to the Americas. The structure, he said modestly, would be "one of the great monuments of the ages." (Illustration credit fm1.2)

How different it was in 1852, when Antonio del Monte y Tejada, a celebrated Dominican *litterateur*, closed the first of the four volumes of his history of Santo Domingo by extolling Colón's "great, generous, memorable and eternal" career. The admiral's every action "breathes greatness and elevation," del Monte y Tejada wrote. Do not "all nations … owe him eternal gratitude"? The best way to acknowledge this debt, he proposed, would be to erect a gigantic Columbus statue, "a colossus like the one in Rhodes," sponsored by "all the cities of Europe and America," that would spread its arms benevolently across Santo Domingo, the hemisphere's "most visible and noteworthy place."

A grand monument to the admiral! To del Monte y Tejada, the merits of the idea seemed obvious; Colón was a messenger from God, his voyages to the Americas the result of a "divine decree." Nonetheless, building the monument took almost a century and a half. The delay was partly economic; most nations in the hemisphere were too poor to throw money at a monstrous statue on a faraway island. But it also reflected the growing unease about the admiral himself. Knowing what we know today about the fate of the Indians on Hispaniola, critics asked, should there be any monument to his voyages at all? Given his actions, what kind of person was buried in the golden box at its center?

The answer is hard to arrive at, even though his life is among the best documented of his time—the newest edition of his collected writings runs to 536 pages of small print.

During his lifetime, nobody knew him as Columbus. The admiral was baptized as Cristoforo Colombo by his family in Genoa, Italy, but changed his name to Cristovao Colombo when he moved to Portugal, where he was an agent for Genoese merchant families. He called himself Cristóbal Colón after 1485, when he moved to Spain, having failed to persuade the Portuguese king to sponsor an expedition across the Atlantic. Later, like a petulant artist, he insisted that his signature be an incomprehensible glyph:

• S •
S • A • S
X M Y
: Χρο FERENS./

(No one is sure what he meant, but the third line could invoke Christ, Mary, and Joseph—*Xristus Maria Yosephus*—and the letters up top may stand for *Servus Sum Altissimi Salvatoris*, "Servant I am of the Highest Savior." Χρο FERENS is probably *Xristo-Ferens*, "Christ-Bearer.")

"A well-built man of greater than average stature," according to a description attributed to his illegitimate son Hernán, the admiral had prematurely white hair, "light-colored eyes," an aquiline nose, and fair cheeks that readily flushed. He was a mercurial man, moody and inconstant one hour to the next. Although subject to fits of rage, Hernán remembered, Colón was also "so opposed to swearing and blasphemy that I give my word I never heard him say any oath other than 'by San Fernando.' " (St. Ferdinand). His life was dominated by overweening personal ambition and, arguably more important, profound religious faith. Colón's father, a weaver, seems to have scrambled from debt to debt, which his son apparently viewed with shame; he actively concealed his origins and spent his entire adult life striving to found a dynasty that would be ennobled by the monarchy. His faith, always ardent, deepened during the long years in which he was vainly begging rulers in Portugal and Spain to back his voyage west. During part of that time he lived in a politically powerful Franciscan monastery in southern Spain, a place enraptured by the visions of the twelfth-century mystic Joachim di Fiore, who believed that humankind would enter an age of spiritual bliss after Christendom wrested Jerusalem from the Islamic forces who had conquered it centuries before. The profits from his voyage, Colón came to believe, would both advance his own fortunes and fulfill di Fiore's vision of a new crusade. Trade with China would pour so much money into Spain, he predicted, "that in three years the Monarchs will be able to set about preparing for the conquest of the Holy Land."

Integral to this grand scheme were Colón's views on the size and shape of the earth. As a child, I—like countless students before me—was taught that Columbus was ahead of his time, proclaiming the planet to be large and round in an era when everyone else believed it to be small and flat. My fourth-grade teacher showed us an etching of Columbus brandishing a globe before a platoon of hooting medieval authorities. A shaft of sunlight illuminated the globe and the admiral's flowing hair; his critics, by contrast, squatted like felons in the shadows. My teacher, alas, had it exactly backward. Scholars had known for more than fifteen hundred years that the world was large and round. Colón disputed both facts.

The admiral's disagreement with the second fact was minor. The earth, he argued, was not perfectly round but "in the shape of a pear, which would all be very round, except for where the stem is, where it is higher, or as if someone had a very round ball, and in one part of it a woman's nipple would be put there." At the very tip of the nipple, so to speak, was "the Earthly Paradise, where nobody can go, except by divine will." (During a later voyage he thought he had found the nipple, in what is now Venezuela.)

The king and queen of Spain cared not a whit about the admiral's views of the world's shape or heaven's location. But they were keenly interested in his ideas about its size. Colón believed the planet's circumference to be at least five thousand miles smaller than it actually is. If this idea were true, the gap between western Europe and eastern China—the width, we know today, of both the Atlantic and Pacific oceans and the lands between them—would be much smaller than it actually is.

The notion enticed the monarchs. Like other European elites, they were fascinated by accounts of the richness and sophistication of China. They lusted after Asian textiles, porcelain, spices, and precious stones. But Islamic merchants and governments stood in the way. If Europeans wanted the luxuries of Asia, they had to negotiate with powers that Christendom had been at war with for centuries. Worse, the mercantile city-states of Venice and Genoa had already cut a deal with Islamic forces, and now monopolized the trade. The notion of working with Islamic entities was especially unwelcome to Spain and Portugal, which had been conquered by the armies of Muhammad in the eighth century and had spent hundreds of years in an ultimately successful battle to repel them. But even if they

did make arrangements with Islam, Venice and Genoa stood ready to use force to maintain their privileged position. To cut out the unwanted middlemen, Portugal had been trying to send ships all the way around Africa—a long, risky, expensive journey. The admiral told the rulers of Spain that there was a faster, safer, cheaper route: going west, across the Atlantic.

In effect, Colón was challenging the Greek polymath Eratosthenes, who in the third century B.C. had ascertained the earth's circumference by a method, the science historian Robert Crease wrote in 2003, "so simple and instructive that it is reenacted annually, almost 2,500 years later, by schoolchildren all around the globe." Eratosthenes concluded that the world is about twenty-five thousand miles around. The east-west width of Eurasia is approximately ten thousand miles. Arithmetic would require that the gap between China and Spain be about fifteen thousand miles. European shipbuilders and potential explorers both knew that no fifteenth-century vessel could survive a voyage of fifteen thousand miles, let alone make the return trip.

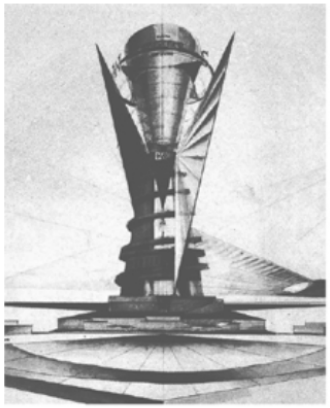
Colón believed that he had, as it were, disproved Eratosthenes. A skilled intuitive seaman, the admiral had plied the eastern Atlantic from Africa to Iceland. During these travels he used a sailor's quadrant in an attempt to measure the length of a degree of longitude. Somehow he convinced himself that his results vindicated the claim, attributed to a ninth-century caliph in Baghdad, that a degree was 56⅔ miles. (It is actually closer to sixty-nine miles.) Colón multiplied this value by 360, the number of degrees in a circle, to calculate the circumference of the earth: 20,400 miles. Coupling this figure with an incorrectly large estimate of the east-west length of Eurasia, Colón argued that the journey across the Atlantic could be as little as three thousand miles, six hundred miles of which could be cut off by setting sail from the newly conquered Canary Islands. This distance could easily be traversed by Spanish vessels.

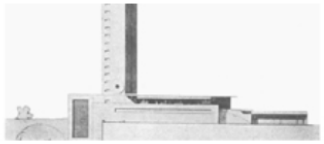
Crossing their fingers that Colón was right, the monarchs submitted his proposal to a committee of experts in astronomy, navigation, and natural philosophy. The committee of experts rolled its collective eyes. From its perspective, Colón's claim that he—a poorly educated man fumbling with a quadrant on a wave-tossed ship—had refuted Eratosthenes was like someone claiming to have demonstrated in a backwoods shack that gravity didn't pull iron as much as scientists thought, and that one could therefore hoist an anvil with a loop of thread. In the end, though, the king and queen ignored the experts—they told Colón to try the thread.

After landing in the Americas in 1492, the admiral naturally claimed that his ideas had been vindicated.* The delighted monarchs awarded him honors and wealth. He died in 1506, a rich man surrounded by a loving family; nevertheless, he died a bitter man. As evidence had emerged of his failings, personal and geographical, the Spanish court had revoked most of his privileges and shunted him aside. In the anger and humiliation of his later years, he slid into religious messianism. He came to believe that he was God's "messenger," destined to show the world "the new heaven and earth of which Our Lord spoke through Saint John in the Apocalypse." In one of his last reports to the king, the admiral suggested that he, Colón, would be the ideal person to convert the emperor of China to Christianity.

Much the same mix of grandiosity and disappointment characterized the Columbus monument. Del Monte y Tejada's proposal for a memorial to the admiral was finally approved in 1923, at a meeting of the Western Hemisphere's governments. Progress was slow—the design competition wasn't held for another eight years, and the monument itself wasn't built for another six decades. During most of that time the Dominican Republic was ruled by the tyrant Rafael Trujillo. A classic case of narcissistic personality disorder, Trujillo erected scores of statues to himself and hung a giant neon sign that read "God and Trujillo" over the harbor of Santo Domingo, which he had renamed Trujillo City. As his reign grew more barbarous, international enthusiasm for the lighthouse waned—supporting the project was seen as endorsing the dictator. Many nations boycotted the inauguration, on October 12, 1992. Pope John Paul II reneged on his promise to

celebrate a Mass at the opening, though he did appear nearby a day before. Meanwhile, protesters set police barricades on fire, denouncing the admiral as "the exterminator of a race." Residents of the walled-off slums around the monument told reporters that they thought Colón deserved no commemoration at all.





Every American nation promised to contribute to the Columbus memorial when it was approved in 1923, but the checks were slow in coming—the U.S. Congress, for example, didn't appropriate its share for another six years. In May of 1930 Dominican army head Rafael Trujillo became president in a fraud-ridden election. Three weeks later a hurricane wiped out Santo Domingo, killing thousands. Deciding that the memorial would symbolize the city's revitalization, Trujillo staged a design competition in 1931. On the jury were eminent architects, including Eliel Saarinen and Frank Lloyd Wright. More than 450 entries came in, including these by (clockwise from top left) Konstantin Melnikov, Robaldo Morozzo della Rocca and Gigi Vietti, Erik Bryggman, and Iosif Langbard. (Illustration credit fm1.3)

A thesis of this book is that their belief, no matter how understandable, is mistaken. The Columbian Exchange had such far-reaching effects that some biologists now say that Colón's voyages marked the beginning of a new biological era: the Homogenocene. The term refers to homogenizing: mixing unlike substances to create a uniform blend. With the Columbian Exchange, places that were once ecologically distinct have become more alike. In this sense the world has become one, exactly as the old admiral hoped. The lighthouse in Santo Domingo should be regarded less as a celebration of the man who began it than a recognition of the world he almost accidentally created, the world of the Homogenocene we live in today.

SHIPLOADS OF SILVER

At a busy corner in a park just south of the old city walls in Manila is a grimy marble plinth, perhaps fifteen feet tall, topped by lifesize bronze statues, blackened by pollution, of two men in sixteenth-century attire. The two men stand shoulder to shoulder, faces into the setting sun. One wears a friar's habit and brandishes a cross as if it were a sword; the other, in a military breastplate, carries an actual sword. Compared to the Columbus Lighthouse, the monument is small and rarely visited by tourists. I found no mention of it in recent guidebooks and maps—a historical embarrassment, because it is the closest thing the world has to an official recognition of globalization's origins.

The man with the sword is Miguel López de Legazpi, founder of modern Manila. The man with the cross is Andrés Ochoa de Urdaneta y Cerain, the navigator who guided Legazpi's ships across the Pacific. One way to summarize the two Spaniards' contribution would be to say that together Legazpi and Urdaneta achieved what Colón failed to do: establish continual trade with China by sailing west. Another way to state their accomplishment would be to say that Legazpi and Urdaneta were to economics what Colón was to ecology: the origin, however inadvertent, of a great unification.

Legazpi, slightly the more well known, was born about a decade after the admiral's first voyage. For most of his life he showed no sign of Colón's penchant for maritime adventure. He trained as a notary, inheriting his father's position in the Basque city of Zumárraga, near the border with France. In his late twenties he went to Mexico, where he worked in the colonial administration for thirty-six years. His life was jerked out of its cozy rut when he was approached by Urdaneta, a friend and cousin who was among the few survivors of Spain's failed attempt, in the 1520s, to establish an outpost in the spice-laden Maluku Islands. (Formerly known as the Moluccas, they are south of the Philippines.) Urdaneta had been shipwrecked in the Malukus for a decade, eventually being rescued by the Portuguese. After returning he had sworn off adventures and joined the Augustinian religious order. Thirty years later, the next king of Spain wanted to take another stab at establishing a base in Asia. He ordered Urdaneta to return to sea. Urdaneta's position as a clergyman made him unable by law to serve as head of the expedition. He chose Legazpi for the job, despite his lack of a nautical background. Legazpi's thoughts about the likelihood of success may be indicated by his decision to prepare for the voyage by selling all of his worldly possessions and sending his children and grandchildren to stay with family members in Spain.

Because Portugal had taken advantage of the Spanish failures to occupy the Malukus, the expedition was told to find more spice islands nearby and establish a trade base on them. The king of Spain also wanted them to chart the wind patterns, to introduce the area to Christianity, and to be a thorn in the side of his nephew and rival, the king of Portugal. But the underlying goal was China—"the stimulus that pulled Spain, as the vanguard of Christendom, to search the seaways," as the historian Antonio García-Abásolo put it in 2004. "One cannot overemphasize the continuity of the goals for the actions undertaken by Colón, [conqueror of Mexico Hernán] Cortés and Legazpi." All of them sought China.

Legazpi and Urdaneta left with five ships on November 21, 1564. Reaching the Philippines, Legazpi set up camp on the island of Cebu, midway up the archipelago. Meanwhile, Urdaneta set about figuring out how to return to Mexico—nobody had ever successfully made the trip. Simply retracing the expedition's westward route was not possible, because the trade winds that had blown the ships from Mexico to the Malukus would impede their return. In a stroke of navigational genius, Urdaneta avoided the contrary currents by sailing far to the north before turning east.

On Cebu, Legazpi was plagued by mutiny and disease and harassed by Portuguese ships. But he slowly expanded Spanish influence north, approaching China. Periodically the Spanish viceroy in Mexico City dispatched reinforcements and supplies. Important among the supplies were silver bars and coins, mined in Mexico and Bolivia, intended to pay the Spanish troops.

A turning point occurred in May 1570, when Legazpi dispatched a reconnaissance mission: two small ships with about a hundred Spanish soldiers and sailors, accompanied by scores of native Filipino Malays in proas (low, narrow outrigger-type boats, rigged with one or two fore-and-aft sails). After two days' northerly sail, they reached the island of Mindoro, about 130 miles south of modern Manila (which is on Luzon, the chain's biggest island). Mindoro's southern coast consists of a number of small bays, one next to another like tooth marks in an apple. The Malays on the expedition learned from local Mangyan people that two Chinese junks were at anchor forty miles away, in another cove—a trading post near the modern village of Maujao (mah-oo-how).

Every spring ships from China traveled to several Philippine islands, Mindoro among them, to exchange porcelain, silk, perfumes, and other goods for gold and beeswax.* Shaded by parasols made of white Chinese silk, the Mangyan descended from their upland homes to meet the Chinese, who beat small drums to announce their arrival. Maujao, which has a freshwater spring a few feet back from the beach, had long been a meeting point; local officials told me that archaeology students have found Chinese porcelain there that dates to the eleventh century. Legazpi had ordered the excursion's commander to contact—politely, not aggressively—any Chinese he encountered. Hearing of the junks' presence, the commander sent one of the two Spanish ships and most of the proas to meet the Chinese "and to request peace and friendship with them."

Leading the contact group was Juan de Salcedo, Legazpi's twenty-one-year-old grandson, popular with and respected by the soldiers despite his youth. Unluckily, high winds separated the vessels; Salcedo's ship was pushed badly off course. The vessels spent the night in different harbors, protected from the storm by the high, narrow fingers of rock that define the coves. Temporarily leaderless but eager to gain the riches of China, the Spanish soldiers in the proas moved east at first light. Rounding a narrow, rocky promontory on the southern side of Maujao, they came upon the Mangyan and Chinese. The Chinese put on a show of force, one of

Salcedo's men later recalled, "beating on drums, playing on fifes, firing rockets and culverins [a kind of small, portable cannon], and making a great warlike display." Taking this as a challenge, the Spaniards attacked—a rash act, "for the Chinese ships were large and high, while the proas were so small and low that they hardly reached to the lower bollards on the enemy's ships." They raked the junks' decks with musket fire, threw grappling hooks over the sides, clambered onto the decks, and killed lots of Chinese traders. Onboard, the attackers found small quantities of silk, porcelain, gold thread, "and other curious articles."

When Salcedo finally arrived in Maujao, hours after the battle, he was "not at all pleased with the havoc." Far from requesting "peace and friendship," as he had ordered, his men had wantonly slain Chinese sailors and left their ships in ruins. (The chronicle, probably written by Martín de Goiti, Salcedo's right-hand man, makes no mention of the Mangyan, whom the Spaniards didn't care about; one assumes they fled the carnage.) Salcedo apologized, freed the survivors, and returned the meager plunder. The Chinese, the expedition member reported, "being very humble people, knelt down with loud utterances of joy." Still, there was a problem. One of the junks was totally destroyed; the other was salvageable, but the ship rigging was so different from European rigging that nobody in the expedition knew how to mend it. Salcedo ordered some of his troops to help the surviving vessel limp to the Spanish headquarters, where Legazpi's men might be able to help.

The Chinese sailed home in their reconstructed junk and reported that Europeans had appeared in the Philippines. Amazingly, they had come from the east, though Europe lay to the west. And the barbarians had something that was extremely desirable in China: silver. Meanwhile, Legazpi took over Manila and waited for their return.

In the spring of 1572, three junks appeared in the Philippines. They contained a carefully chosen selection of Chinese manufactured goods—a test of what Legazpi would pay for, and pay the most for. It turned out the Spaniards wanted everything, a result, Legazpi's notary reported, that "delighted" the traders. Especially coveted were silk, rare and costly in Europe, and porcelain, made by a technology then unknown in Europe. In return, the Chinese took every ounce they could of Spanish silver.

More junks came the next year, and the year after that. Because China's hunger for silver and Europe's hunger for silk and porcelain were effectively insatiable, the volume of trade grew enormous. The "galleon trade," as it would become known, linked Asia, Europe, the Americas, and, less directly, Africa. (African slaves were integral to Spain's American empire; as I describe later, they and their descendants far outnumbered Europeans there.) Never before had so much of the planet been bound in a single network of exchange—every populous area on earth, every habitable continent except Australia. Dawning with Spain's arrival in the Philippines was a new, distinctly modern era.

That era was regarded with suspicion from the beginning. China was then the earth's wealthiest, most powerful nation. By virtually any measure—per capita income; military strength; average lifespan; agricultural production; culinary, artistic, and technical sophistication—it was equal to or superior to the rest of the world. Much as rich nations like Japan and the United States today buy little from sub-Saharan Africa, China had long viewed Europe as too poor and backward to be of commercial interest. Its principal industry was textiles, mainly wool. China, meanwhile, had *silk*. Reporting to the Spanish king in 1573, the viceroy in Mexico lamented that "neither from this land nor from Spain, so far as can now be learned, can anything be exported thither that they do not already possess." With silver, though, Spain finally had something China wanted. Badly wanted, in fact—Spanish silver literally became China's money supply. But there was an unease about having the nation's currency in the hands of foreigners. The court feared that the galleon trade—the first large-scale, uncontrolled international exchange in Chinese history—would usher in large-scale, uncontrolled change to Chinese life.

The fears were entirely borne out. Although emperor after emperor refused entry to almost all human beings from Europe and the Americas, they could not keep out other species. Key players were American crops, especially sweet potatoes and maize;* their unexpected arrival, the agricultural historian Song Junling wrote in 2007, was "one of the most revolutionary events" in imperial China's history. The nation's agriculture, based on rice, had long been concentrated in river valleys, especially those of the Yangzi and Huang He (Yellow) rivers. Sweet potatoes and maize could be grown in the dry uplands. Farmers moved in numbers to these areas, which had previously been lightly settled. The result was a wave of deforestation, followed by waves of erosion and floods, which caused many deaths. The regime, already straining under many problems, was further destabilized—to Europe's benefit.

Spain, too, was uneasy about the galleon trade. The annual shipments of silver to Manila were the culmination of a centuries-long quest to trade with China. Nonetheless, Madrid spent almost the entire period trying to limit the exchange. Again and again, royal edicts restricted the number of ships allowed to travel to Manila, cut the amount of allowable exports, set import quotas for Chinese goods, and instructed Spanish merchants to form a cartel to raise prices.

From today's perspective the Spanish discontent is surprising. Both sides gained by the exchange of silk for silver, as economic theory would predict. But it was Europe that emerged in the stronger position. With the galleon trade, declaimed the historian Andre Gunder Frank, "Europeans bought themselves a seat, and then even a whole railway car, on the Asian train." Legazpi's encounter with the Chinese signaled the arrival of the Homogenocene in Asia. And following it, gliding in the slipstream, came the rise of the West.

The statue of Legazpi and Urdaneta was not intended to commemorate any of these ideas or events. It was proposed in 1892 by Manila's Basque community to celebrate the Basque role in the city's history (Legazpi and Urdaneta were Basques, as were many of their men). By the time Catalan sculptor Agustí Querol i Subirats cast the bronze, the United States had seized the Philippines from Spain. The islands' new rulers had little interest in a monument to dead Spaniards; the statue languished at a customs house until 1930, when it was finally erected.

Walking around the monument, I wished that it were larger, given that it is the closest equivalent to a formal commemoration of globalization we have today. I also wished it were more complete. To truly mark the galleon trade, Legazpi and Urdaneta would have to be surrounded by Chinese merchants: equal partners in the exchange. Such a monument probably will never be built, not least because the worldwide network is still viewed with unease, even by many of its beneficiaries.

Across the street from the monument is another, more popular park, named after José Rizal, a writer, doctor, and martyred anti-Spanish revolutionary who is a national hero in the Philippines. At the center of Rizal Park is a reflecting pool edged with flower gardens and statuary. All the statues are bronze busts on concrete columns. All depict Filipinos who died fighting Spanish rule.

On the side of the pool facing the Legazpi monument is a bust of Rajah Sulayman, identified by a plaque as "the brave Muslim ruler of the kingdom of Maynila (Manila) who refused the offer of 'friendship' by the Spaniards … under Miguel Lopez de Legazpi." (Parentheses in original.) Good editors deride fake quotation marks like those around "friendship" as "scare quotes" and tell reporters not to use them. Here they may be merited. Legazpi approached Sulayman soon after encountering the Chinese. The Spaniards wanted to use Manila's harbor as a launching point for the China trade. When Sulayman said he didn't want the Spaniards around, Legazpi leveled his principal village, killing him and three hundred of his fellows. Modern Manila was established on the ruins.

As close to a monument to globalization as the world is likely to see, this statue to Miguel López de Legazpi and Andrés de Urdaneta, initiators of the silver trade across the Pacific, occupies a little-frequented corner of a park in central Manila. (Illustration credit fm1.4)

Sulayman and the other people around the pool were, in effect, the first antiglobalization martyrs. They have been awarded a place considerably more prominent than the deserted corner given to Legazpi and Urdaneta. In the end, though, they lost, each and every one of them.

Big speakers mounted on iron columns at the corners of the pool issue bulletins from the redoubts of Classic Rock. Walking around the area, I was nearly run over by a train fashioned into a replica of Thomas the Tank Engine, a children's-book and -television character owned by Apax Partners, a British private-equity firm said to be among the world's largest. Over Thomas's smiling, tooting head I could see the towers of the hotels and banks in Manila's tourist district. The birthplace of globalization looked a lot like many other places. In the Homogenocene, Kentucky Fried Chicken, McDonald's, and Pizza Hut are always just minutes away.

REVERSALS OF FORTUNE

The Homogenocene? A new epoch in the history of life, brought into being by the abrupt creation of a world-spanning economic system? The claim seems grandiose. But imagine a thought experiment: flying around the earth in 1642, a century and a half after Colón's first voyage, threescore and ten after the first Chinese silk from Manila arrived in Mexico. Think of it as a round-the-world cruise at 35,000 feet of a planet in the first stages of a great disturbance. The brochure promises that the cruise will hit the highlights of the nascent Homogenocene. What will the passengers see?

One answer would be: a world bound together by hoops of Spanish silver. Silver from the Americas is well on its way to doubling or tripling the world's stock of precious metals. Potosí, in what is now southern Bolivia, is the main source—the biggest, richest strike in history. Begin the cruise here, at this central node in the network. Located more than thirteen thousand feet up the Andes, Potosí sits at the

foot of an extinct volcano that is as close to a mountain of pure silver as geology allows. Around it is an almost treeless plateau, strewn with glacial boulders, scoured by gelid winds. Agriculture struggles here, and there is no wood for fire. Nonetheless, by 1642 this mining city had become the biggest, densest community in the Americas.

Potosí is a brawling, bawling boomtown marked by extravagant display and hoodlum crime. It is also a murderously efficient mechanism for the extraction and refining of silver ore in appallingly harsh conditions. Indian workers haul the ore on their backs up crude ladders from hundreds of feet below the surface, then extract the silver by mixing the ore with highly toxic mercury. Smelters on the slopes transform the metal into bars of almost pure silver, typically weighing sixty-five pounds and stamped with sigils guaranteeing their quality and authenticity. Other silver is stamped into coins—the Spanish peso is on its way to becoming a de facto world currency, as the U.S. dollar is today. Battalions of llamas—more sure-footed and altitude tolerant than mules and horses—carry the coins and bars down from the mountains, every dangerous step guarded by men with weapons. They hoist the silver onto ships in Arica, on the Chilean coast, which shuttle it to the great port of Lima, seat of the Spanish colonial government. From Lima the silver is loaded onto the first of a series of military convoys that will transport it across the world.

From the plane, follow the silver fleet as it travels north. To the east of the convoy rise the Andean slopes, gripped in ecological turmoil. Humankind has lived here for many thousands of years, erecting some of the world's first urban complexes in the valleys north of Lima. A hundred and fifteen years before this overflight, smallpox swept in. After it came other European diseases, and then Europeans themselves. Millions died, fearful and suffering, in shattered mountain villages. Now, decades later, slopes terraced and irrigated for centuries remain empty. Shrubs and low trees have overwhelmed abandoned farms. A huge volcanic eruption in 1600 covered central Peru with up to three feet of ash and rubble. Four decades later, little has been cleared away. Andean ecosystems have gone feral. Sailing north, the silver fleet is passing something akin to wilderness, at least in patches.

Some of the vessels anchor in Panama, while others go to Mexico. Watching from the plane, observe that the Panamanian silver crosses the isthmus, bound for Europe, whereas most of the Mexican silver is bound ultimately for Asia. How much goes where is the subject of brisk dispute, both by customs officials in 1642 and by historians today. The Spanish monarchy, perpetually hungry for cash, wants the silver in the home country. Spanish colonists want to send as much as possible to China—coins and bars can be traded there more profitably than anywhere else. The tension leads, inevitably, to smuggling. Official statistics suggest that no more than a quarter of the silver went across the Pacific. In the past historians have largely assumed that government scrutiny kept the smuggling to perhaps 10 percent of the total, meaning that the official statistics were roughly correct. A new wave of researchers, however, argues that smuggling was rampant; China sucked up as much as half of the silver. The debate is not simple pedantry. One side regards European expansion as the primary motivating force in world affairs; the other views the earth as a single economic unit largely driven by Chinese demand.

Follow the Europe-bound silver as it is carried by mule train over the mountains to Portobelo, then Panama's main Caribbean port. Guarded by an armada of galleons, bristling with guns and crewed by as many as two thousand seamen and soldiers, the silver traverses the Atlantic every summer, its departure timed to avoid hurricane season. The convoy bellies up to the mouth of the Guadalquivir, Spain's only major navigable river, and then sixty miles upstream to Seville.

Unloaded onto the quays, the chests of treasure are the emblem of a paradox: silver from the Americas has made the Europe of 1642 affluent and powerful beyond its giddiest fantasy. But Europe itself is plagued from one end to the other by war, inflation, rioting, and weather calamities. Turmoil is nothing new in Europe, which is divided by language, culture, religion, and geography. But this is the first time that the turmoil is intimately linked to human actions on opposite ends of the

earth. Trouble volleys from Asia, Africa, and the Americas to Europe, shuttling about the world on highways of Spanish silver.

Cortés's conquest of Mexico—and the plunder that came from it—threw Spain's elite into delirium. Enraptured by sudden wealth and power, the monarchy launched a series of costly foreign wars, one overlapping with another, against France, the Ottoman Empire, and the Protestants in the Holy Roman Empire. Even as Spain defeated the Ottomans in 1571, discontent in the Netherlands, then a Spanish possession, was flaring into outright revolt and secession. The struggle over Dutch independence lasted eight decades and spilled into realms as far away as Brazil, Sri Lanka, and the Philippines. Along the way, England was drawn in; raising the ante, Spain initiated a vast seaborne invasion of that nation: the Spanish Armada. The invasion was a debacle, as was the fight to stop rebellion in the Netherlands.

War spawned war. In 1642, Spain is combating secession in Andalusia, Catalonia, and Portugal, which it has ruled for six decades; France is fighting Spain on its northern, eastern, and southern borders; and Swedish armies are battling the Holy Roman Empire. (Emperor Ferdinand III, the son-in-law of one Spanish king and the future father-in-law of another, is so closely allied with Spain that he has often been called a Spanish puppet.) Almost the only European nation not directly or indirectly at war with Spain is England, which is convulsed by its own civil strife—the ascetic Puritan rebellion that will soon lead to civil war and the execution of the king.

The costs are staggering. At the height of the Vietnam War, the United States fielded about 500,000 soldiers. If the U.S. had wanted to send out the same proportion of its men that Spain did in its war with the Dutch, according to Dennis Flynn, an economic historian at the University of the Pacific, it would have had to send 2.5 *million*. "Even though all this silver was coming in from Bolivia, Spain didn't have enough money to pay its army in the Netherlands," he told me. "So the men mutinied constantly. I did a count once—there were forty-five mutinies between 1572 and 1607. And that was just *one* of Spain's wars."

To pay for its foreign adventures, the court borrowed from foreign bankers; the king felt free to incur debts because he believed they would be covered by future shipments of American treasure, and bankers felt free to lend for the same reason. Alas, everything cost more than the monarch hoped. Debt piled up hugely—ten or even fifteen times annual revenues. Nonetheless the court continued to view its economic policy in the optative mood; few wanted to believe that the good times would end. The inevitable, repeated result: bankruptcy. Spain defaulted on its debts in 1557, 1576, 1596, 1607, and 1627. After each bankruptcy, the king borrowed more money. Lenders would provide it—after all, they could charge high interest rates (Spain paid up to 40 percent, compounded annually). For obvious reasons the high interest rates made the next bankruptcy more likely. Still the process continued—everyone believed the silver would keep pouring into Seville. Now, in 1642, so much silver has been produced that its value is falling even as the mines slacken. The richest nation in the world is hurtling toward financial Armageddon. Europe is complexly interconnected; Spain's economic collapse is dragging down its neighbors.

The silver trade was not the only cause of this tumult—religious conflict, royal hubris, and struggles among classes all were important—but it was an essential part. The flood of precious metal unleashed by Cortés so vastly increased Spain's money supply that its small financial sector could not contain it. It was as if a billionaire suddenly deposited a fortune into a tiny country bank—the bank would immediately redeposit the cash into other, bigger institutions that could do something with it. American silver overflowed from Spain like water from a bathtub and washed into bank vaults in Italy, the Netherlands, and the Holy Roman Empire. Payments for Spanish military adventures filled coffers across the continent.

Economics 101 predicts what will happen in these circumstances. New money chases after the same old goods and services. Prices rise in a classic inflationary spiral. In what historians call a "price revolution," the cost of living more than

doubled across Europe in the last half of the sixteenth century, tripling in some places, and then rose some more. Because wages did not keep pace, the poor were immiserated; they could not afford their daily bread. Uprisings of the starving exploded across the continent, seemingly in every corner and all at once. (Researchers have called it the "general crisis" of the seventeenth century.)

Hope for the peasantry was provided by American crops, which by 1642 have ridden the silver route across the Atlantic. As the plane sweeps over Europe, it descends low enough for passengers to view the marks of the Columbian Exchange: plots of American maize in Italy, carpets of American beans in Spain, fields crowded with the shining, upturned visages of American sunflowers in France. Big tobacco leaves soak up sunlight on Dutch farms; tobacco is so common in Catholic Europe that Pope Urban VIII has this year denounced its use (in Protestant England, it is endorsed even by the nation's most notorious killjoy, Oliver Cromwell). Most important will be the potato, which is beginning to fill bellies in Germany, the Netherlands, and, increasingly, Ireland. In ordinary times, the quickly increasing agricultural productivity would soothe some of the discontent caused by inflation and war. But these are not ordinary times: the plane's instruments reveal that the climate itself has been changing.

For almost a century Europe has experienced frighteningly snowy winters, late springs, and cold summers. Frigid Mays and Junes delay French wine harvests until November; people walk a hundred miles across the frozen sea from Denmark to Sweden; Greenland hunters moor their kayaks on the Scottish shore. After three failed harvests, Catholic mobs in Ireland rise up, robbing and killing the hated English Protestants—attacks those Protestants use as an opportunity to seize Catholic land. Fearing that growing Alpine glaciers will overrun their homes, Swiss villagers induce their bishop to exorcise a threatening ice front—an echo of the Spaniards in Santo Domingo, seeking God's help against the plague of ants. Annual visits from the bishop drive back the glacier by eighty paces. The order of the world seems overturned.

Historians call the freeze the Little Ice Age. Enduring from about 1550 to about 1750 in the Northern Hemisphere, this global thermal anomaly is difficult to pin down; its onset and duration differed from one region to the next. Because few people then kept written records of weather conditions, paleoclimatologists (researchers of ancient climate) must study it with imperfect measures like the thickness of tree rings and the chemical composition of tiny bubbles of gas in polar ice. Based on such indirect evidence, some researchers proposed that the Little Ice Age was attributable to a decline in the number of sunspots known as the Maunder Minimum. Because sunspots are correlated with the sun's energy output, fewer sunspots implies less-intense solar irradiation—enough, these researchers argued, to cool the earth. Other scientists theorized that the temperature drop was due to big volcanic eruptions, which blast sulfur dioxide into the upper atmosphere. High above the clouds, the sulfur dioxide mixes with water vapor to form minute droplets of sulfuric acid—shiny motes in the sky—that reflect some of the sun's light into space. This phenomenon existed in 1642; a massive eruption in the southern Philippines the year before is now thought to have cooled the earth for as long as three years. Both hypotheses have drawn sharp criticism, though. Many scientists believe that the impact of the Maunder Minimum was too small to account for the Little Ice Age. Others argue that a series of individual volcanic eruptions could not have caused a steady temperature drop.

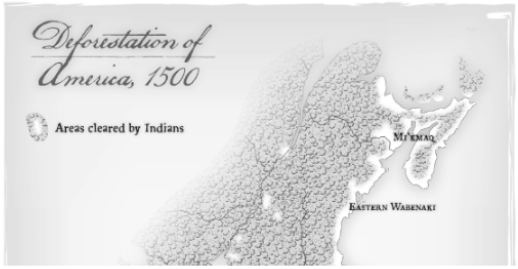
In 2003, William F. Ruddiman, a paleoclimatologist at the University of Virginia, suggested a different cause for the Little Ice Age—an idea that initially seemed outlandish, but that is increasingly treated seriously.

As human communities grow, Ruddiman pointed out, they open more land for farms and cut down more trees for fuel and shelter. In Europe and Asia, forests were cut with the ax. In the Americas before Colón, the primary tool was fire—vast stretches of it. For weeks on end, smoke from Indian bonfires shrouded Florida, California, and the Great Plains. Today, many researchers believe that without regular burning, much of the midwestern prairie would have been engulfed by an

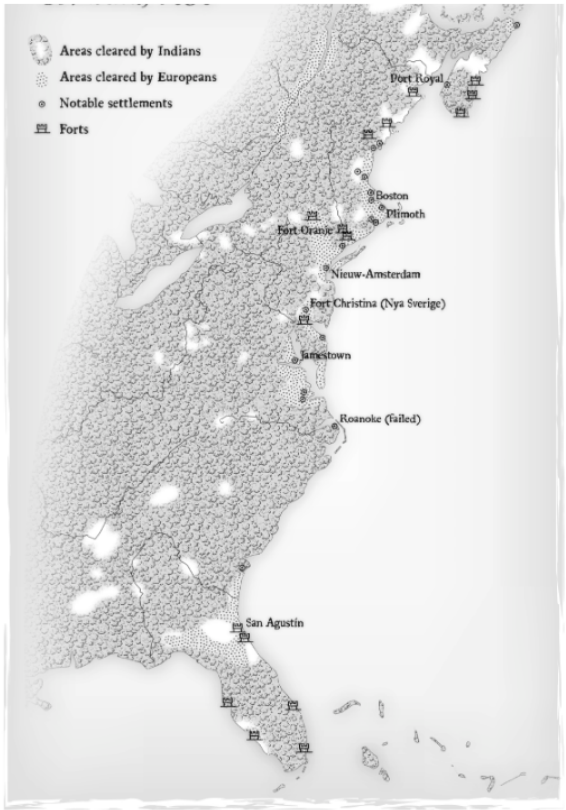
invading tide of trees. The same was true for the grasslands of the Argentine pampas, the hills of Mexico, the Florida dunes, and the high plains of the Andes.

American forests, too, were shaped by flame. Indians' "frequent fiering of the woods," remarked English colonist Edward Johnson in 1654, made the forests east of the Mississippi so open and "thin of Timber" that they were "like our Parkes in England." Annual fire seasons removed scratchy undergrowth, burned out noxious insects, and cleared land for farms. Scientists have conducted fewer studies of burning in the tropics, but two California paleoecologists (scientists who study past ecosystems) surveyed the fire history of thirty-one sites in Central and South America in 2008 and found that in every one the amount of charcoal in the soil—an indicator of fire—had increased substantially for more than two thousand years.

Enter now the Columbian Exchange. Eurasian bacteria, viruses, and parasites sweep through the Americas, killing huge numbers of people—and unraveling the millennia-old network of human intervention. Flames subside to embers across the Western Hemisphere as Indian torches are stilled. In the forests, fire-hating trees like oak and hickory muscle aside fire-loving species like loblolly, longleaf, and slash pine, which are so dependent on regular burning that their cones will only open and release seed when exposed to flame. Animals that Indians had hunted, keeping their numbers down, suddenly flourish in great numbers. And so on.



Using fire, indigenous people in the Americas cleared big areas for agriculture and hunting, as shown in this map of North America's eastern seaboard. European diseases caused a population crash across the hemisphere—and an extraordinary ecological rebound as forests filled in abandoned fields and settlements. (Map credit Map1.3)



The end of native burning and the massive reforestation drew so much carbon dioxide from the air that an increasing number of researchers believes it was a main driver of the three-century cold snap known as the Little Ice Age.

Indigenous pyromania had long pumped carbon dioxide into the air. At the beginning of the Homogenocene the pump suddenly grows feeble. Formerly open grasslands fill with forest—a frenzy of photosynthesis. In 1634, fourteen years after the Pilgrims land in Plymouth, colonist William Wood complains that the once-open forests are now so choked with underbrush as to be "unuseful and troublesome to travel through." Forests regenerate across swathes of North America, Mesoamerica, the Andes, and Amazonia.

Ruddiman's idea was simple: the destruction of Indian societies by European epidemics both decreased native burning and increased tree growth. Each subtracted carbon dioxide from the air. In 2010 a research team led by Robert A. Dull of the University of Texas estimated that reforesting former farmland in American tropical regions alone could have been responsible for as much as a quarter of the temperature drop—an analysis, the researchers noted, that did not include the cutback in accidental fires, the return to forest of unfarmed but cleared areas, and the entire temperate zone. In the form of lethal bacteria and viruses, in other words, the Columbian Exchange (to quote Dull's team) "significantly influenced Earth's carbon budget." It was today's climate change in reverse, with human action removing greenhouse gases from the atmosphere rather than adding them—a stunning meteorological overture to the Homogenocene.

Flying the plane back across the Atlantic, the effects of the Little Ice Age are obvious in the Americas, too. Clearly visible from the air is the filling in of Indian lands by forest—and by snow. Ice is solid enough that people ride carriages on Boston harbor; it freezes over most of Chesapeake Bay, and nearly wipes out the two score French colonists who this year have founded Montreal. Introduced cattle

and horses die in snowdrifts in Maine, Connecticut, and Virginia. Other impacts are harder to see. The forests are filling in former Indian lands with cold-loving species like hemlock, spruce, and beech. Vernal pools take longer to evaporate in the canopy they provide in these cool summers. Mosquitoes that breed in those pools thus have an increased chance for survival.

Among these paradoxically cold-loving mosquitoes is *Anopheles quadrimaculatus*, the overall name for a complex of five near-indistinguishable sibling species. Like other *Anopheles* mosquitoes, *A. quadrimaculatus* hosts the parasite that causes malaria—the insect's common name is the North American malaria mosquito. Southeast England at this time is rampant with malaria. Precise documentation will never become available, but there is good reason to suspect that by 1642 malaria has already traveled in immigrant bodies from England to the Americas. A single bite into an infected person is enough to introduce the parasite to its mosquito host, which spreads the parasite far and wide. Virginia and points south have already proven so unhealthy for Europeans that plantation overseers are finding it difficult to persuade laborers to come from overseas to work in the tobacco fields.

Some landowners already have resolved this problem by purchasing workers from Africa. Partly driven by the introduction of malaria, a slave market is beginning to quicken into existence, a profitable exchange that will entwine itself over time with the silver market. As ever, the ships from Africa will form a kind of ecological corridor, through which travel passengers not on any official manifest. Crops like yams, millet, sorghum, watermelon, black-eyed peas, and African rice will follow the slave ships to the Americas. So will yellow fever.

Beyond Chesapeake Bay the airplane flies west, heading toward Mexico. Beneath its wings unfurl the Great Plains. From their southern edge come herds of Spanish horses, scores at a time, brought by silver galleons on the return trip across the Atlantic. Apache and Ute race hundreds of miles south to meet the horses, followed by Arapaho, Blackfoot, and Cheyenne. As European villagers learned from Mongol horsemen, peasant farmers, tied to their land, are sitting ducks for cavalry assault. The rush by Indian nations to acquire horses is thus a kind of arms race. All over the North American West and Southwest, native farmers are abandoning their fields and leaping onto the backs of animals from Spain. Long-sedentary societies are becoming wanderers; the "ancient tradition" of the nomadic Plains Indian is coming into existence, a rapid adaptation to the Columbian Exchange.

As natives acquire horses, they come into conflict with each other and the labor force on Spain's expanding ranches. The ranch workers are Indians, African slaves, and people of mixed ancestry. In a kind of cultural panic, the colonial government has created a baroque racial lexicon—mestizo, mulatto, coyote, *morisco, chino, lobo, zambaigo, albarazado*—to label particular genetic backgrounds. All of these people and more meet in Mexico City, the capital of New Spain, the richest piece of Spain's American empire. Wealthier and more populous than any city in Spain, it is an extraordinary jumble of cultures and languages, with no one group forming the majority. Neighborhoods are divided by ethnicity—one entire barrio is occupied by Tlaxcalans from the east. As the back-and-forth continues, engineers struggle to prevent the city from physical collapse. Mexico City has flooded six times in the last four decades, once remaining inundated for five years. A troubled, teeming, polyglot metropolis with an opulent center and seething ethnic neighborhoods at its periphery that is struggling to fend off ecological disaster—from today's perspective, the Mexico City of 1642 seems strikingly familiar. It is the world's first twenty-first-century city.

The airplane flies west, to Acapulco, on Mexico's Pacific coast, the eastern terminus of the galleon trade. Ringed by protective mountains, untroubled by sandbars or shoals, the harbor is a majestic setting for one of the more listless settlements in the Americas: several hundred huts scattered like lost clothes at the edge of the water. Most of Acapulco's few permanent inhabitants are African slaves, Indian laborers, and Asian sailors who jumped ship (the galleons are mainly

crewed by Filipinos, Chinese, and other Asians). When the galleons arrive, Spaniards show up, some of them coming from as far as Peru. A market and fair springs into existence; millions of pesos change hands. Then the town empties again as the ships are beached and readied for the next trip across the Pacific.

Follow the silver to its destination in China. The Little Ice Age has taken hold in East Asia, too, though here the impact is typically less a matter of snow and ice than of crashing, copious rain alternating with bouts of cold drought. The five worst years of drought in five centuries occurred between 1637 and 1641. This year, rain is drowning the crops. All the impacts have been exacerbated by a series of volcano eruptions in Indonesia, Japan, New Guinea, and the Philippines. Millions have died. Cold, wet weather and mass deaths ensure that more than two-thirds of China's farmland is no longer being tilled, adding to the famine. Cannibalism is rumored to be frequent. The Ming court—paralyzed by infighting, preoccupied with wars to the north—does little to help the afflicted. It simply doesn't have the funds. Like the Spanish king, the Ming emperor backs his military ventures with Spanish silver, which his subjects must use to pay their taxes. When the value of silver falls, the government runs out of money.

The Ming have long believed their duty is to protect China from malign foreign influence. They have failed. American crops like tobacco, maize, and sweet potato are spreading over hillsides. American silver is dominating the economy. Although the emperors don't know it, American trees are helping to bring the rains. All of these are working against the Ming. Popular discontent is already at such levels that mobs of peasant rebels are tearing violently through half a dozen provinces. Unhappy, unpaid soldiers are mutinying. Flood and famine simply exacerbate the anger. In two years Beijing will fall to a rebellious ex-soldier. Weeks later, the soldier will be overthrown by the Manchus, who establish a new dynasty: the Qing (pronounced, roughly speaking, "ching").

When Colón founded La Isabela, the world's most populous cities clustered in a band in the tropics, all but one within thirty degrees of the equator. At the top of the list was Beijing, cynosure of humankind's wealthiest society. Next was Vijayanagar, capital of a Hindu empire in southern India. Of all urban places, these two alone held as many as half a million souls. Cairo, next on the list, was apparently just below this figure. After these three, a cluster of cities were around the 200,000 mark: Hangzhou and Nanjing in China; Tabriz and Gaur in, respectively, Iran and India; Tenochtitlan, dazzling center of the Triple Alliance (Aztec empire); Istanbul (officially Kostantiniyye) of the Ottoman empire; perhaps Gao, leading city of the Songhay empire in West Africa; and, conceivably, Qosqo, where the Inka emperors plotted their next conquests. Not a single European city would have made the list, except perhaps Paris, then expanding under the vigorous rule of Louis XII. Colón's world was centered around hot places, as had been the case since *Homo sapiens* first stared in amazement at the African sky.

Now, a century and a half later, that order is in the midst of change. It is as if the globe has been turned upside down and all the wealth and power are flowing from south to north. The once-lordly metropolises of the tropics are falling into ruin and decrepitude. In the coming centuries, the greatest urban centers will all be in the temperate north: London and Manchester in Britain; New York, Chicago, and Philadelphia in the United States. By 1900 every city in the top bracket will be in Europe or the United States, save one: Tokyo, the most Westernized of eastern cities. From the vantage of an extraterrestrial observer, the change would have seemed shocking; an order that had characterized human affairs for millennia had been overturned, at least for a while.

Today the tumult of ecological and economic exchange is like the background radiation of our ever more crowded and unstable planet. It seems distinctly contemporary to find Japanese loggers in Brazil and Chinese engineers in the Sahel and Europeans backpacking in Nepal or occupying the best tables in New York niteries. But in different ways all of these occurred hundreds of years ago. If nothing else, the events then remind us that we are not alone in our current jumbled condition. It seems worthwhile to take a look at how we got to where we are today.

* Short of water, the expedition drank from rivers. Some researchers believe that Colón and his men thus caught shigellosis, a disease caused by a feces-borne bacterium native to the American tropics. In reaction to the bacterium, the body can develop Reiter's syndrome, an autoimmune disease that makes sufferers feel as if large chunks of the body, including the eyes and bowels, are swollen and inflamed—symptoms that afflicted Colón later that summer. Reiter's is always painful and sometimes fatal. If, as these scientists suspect, Reiter's led, years later, to the admiral's death, Columbus himself was an early victim of the Columbian Exchange.

* Every species has a scientific name with two parts: the name of its genus—the group of related species it belongs to—and the species name proper. Thus *Solenopsis geminata* belongs to the genus *Solenopsis* and is the species geminata. By convention, the genus is abbreviated after the first time it appears with the species name: *S. geminata*.

* It is conceivable that Colón knew before his departure that the Atlantic could be crossed. He wrote in the margin of one of his books that while in Ireland he'd seen "people from Cathay [China]"—"a man and a wife brought in on a couple of logs in an extraordinary manner." Some writers argue that the "logs" were dugout canoes, and the people therefore Inuit or Indians. Most historians do not agree, though, because there is little evidence that Colón visited Ireland, let alone that he saw two Indians there. The couple could have been Sami from Finland, who often have Asian features. In addition it seems implausible that the sole record of this amazing event—Indians paddling a canoe to Europe!—should be a few marginal scribbles in a book.

* Because China did not make enough beeswax for its needs, many Chinese made candles from a substitute: the lower-quality wax produced by a scale insect. The Philippines house both the Asian honeybee and the giant honeybee; the huge nests of the latter are rich sources of wax.

* In the United States the name is "corn." I use "maize" hereafter for two reasons. First, multicolored Indian maize, which was usually eaten after drying and grinding, is strikingly unlike the sweet yellow kernels conjured up in the U.S. by the word "corn." Second, "corn" in Britain refers to a region's most important cereal crop—oats in Scotland, for example.