Christopher Columbus as a Botanist

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Using Columbus' log as a guide, a biologist retraces the Voyage of Discovery from a botanical perspective.

“Demimillennial” rings more grandly to my ear than “quincentennial.” The question of which word to choose arises from the fact that 1992 follows 1492 by five hundred years. By whichever name you call it, 1992 will see pageantry of a lifetime on both sides of the ocean that was first crossed at tropical latitudes by Christopher Columbus, thereby stretching minds, opening pocketbooks, changing civilizations, filling royal coffers, inviting wars, enslaving peoples, and incidentally moving plants around the globe in a way that a single historical event has rarely entrained before or since.

As part of the celebration, WGBH-TV Boston produced a seven-program series on the voyage of Columbus that first aired on PBS in the fall of 1991 and is scheduled for rebroadcast in 1992. An unexpected set of circumstances suddenly involved me in that television series. On six short weeks’ notice I found myself in San Salvador, Bahamas, a probable spot where Columbus first made landfall on New World shores. There I boarded the SSV (Sailing School Vessel) Westward, a magnificent 125-foot staysail schooner belonging to the Sea Education Association of Woods Hole, Massachusetts (Figure 1). The ship was about to retrace, with a small class of students and the WGBH filming crew, the course Columbus took from island to island as he explored the New World.

My role was to lecture to the students about the plants and plant materials Columbus was looking for, what he actually found, and what he thought he found. A most important aim was to attempt to deduce from the roughly 250 botanically related entries in Columbus’ log of this first voyage as much as I could about the man himself. Along the way, my deductions met counterfoil and amplification from the several nautical, archaeological, and historical specialists aboard and ashore as we worked together to flesh a log account written five centuries ago into a real person and to materialize the now almost mythical first voyage into a real event.

Here I wish to share with readers some of the more interesting insights that have come from this experience, really an unparalleled adventure, that began in San Salvador and ended in Puerto Plata, Dominican Republic. Our general route took us first south-southwest through the southern Bahamas, where we turned east as did Columbus, sailing into the trade winds, making several stops along the rural Cuban coast. We sailed across to Hispaniola and made several more stops along the northern shore of Haiti, including the spot where the Santa Maria sank and the sites of the first and second European settlements in the tropical New World, Navidad and Isabela (Figure 2).

Columbus Encounters Sargasso

The botanical entries actually begin early, however, on the transatlantic leg of Columbus’ voyage from the Canary Islands.
Figure 1. The 125-foot staysail schooner, SSV Westward, under sail in the Caribbean as it follows Columbus' course through the New World. Photo by John M. Kingsbury.
They record observations that had special significance in the changing attitudes of the crews, as the three small vessels traversed unknown waters, and the increasing urge toward mutiny.

The Niña, Pinta, and Santa Maria were crewed by some eighty-seven to ninety men, most of whom were simple sailors who had rarely been far offshore, recruited suddenly and perhaps with some coercion from the ordinary maritime people of the Spanish seashore. The first botanical entries in the log (which, in a nautical sense, is really more of a daily journal or diary than a simple record of courses, distances, sail settings, and weather) had to do with seaweed. The seaweed entries begin on September 16, the tenth day away from the Canaries, and continue until October 8, two days before land was sighted. Altogether there are twelve entries on seaweed in that four-week period of sailing into the unknown.

Christopher Columbus had perhaps, or even probably, heard some sketchy accounts of what we know now as the Sargasso Sea from Portuguese mariners who had ventured
far enough west to have encountered its eastern edge. But Columbus was the first person to experience it fully, to traverse its vastness, and to record a transect of it. This is of great historical and biological importance. Of equal importance is the reaction of his sailors to the seaweed with which the Sargasso Sea is populated.

In most instances when we look at the botanical entries, we first have to overcome the problem of what Columbus actually meant when he identified a plant with a word or phrase in the Castilian Spanish of five centuries ago. Fifteenth-century Spanish plant names were, of course, those of two and a half centuries before the great Swedish botanist Linnaeus and his contemporaries brought some stability into botanical nomenclature.

The seaweed of Columbus, however, is easily identified with the genus Sargassum for two reasons: Columbus described it well, and no other seaweed lives in that part of the open ocean. In the log entry for September 16, Columbus records: "We have begun to see large patches of yellowish green weed, which seems to have been torn away from some island or reef. I know better because I make the mainland to be farther on." September 17: "I saw a great deal of weed today from rocks that lie to the west. I take this to mean we are near land. The weed resembles a grass except that it has long stalks and shoots and is loaded with fruit like the mastic tree."

The two species of Sargassum that inhabit the Sargasso Sea are yellowish branching plants with long irregular stalks, leaf-like blades (with midvein), and small, spherical, fruitlike bladders scattered in the branchlets (Figure 3). Columbus' description fits the plant quite well.

Nearly all seaweeds, whether of the red, green, or brown groups, are firmly attached to the substrate. Unlike land plants, they do not have roots, nor do they obtain mineral nutrition from the substrate. They do not have to because the seawater surrounding them contains everything they need, though not always in abundance. What they do require is that the water next to their surfaces be continuously replenished. By attaching to rocks or other permanent, hard underwater surfaces, a seaweed stays put as waves and currents wash by, bringing it new nutrients and taking its wastes away. If you tear a seaweed free from its rock attachment, look at it, and then put it back in the water, it floats about, moving with the water surrounding it, and soon exhausts the nutrients within immediate reach of its surface. Its wastes accumulate there, too. Usually within a matter of days under these conditions the seaweed dies, decays, and disappears.

Although they may not have known the reason why, the sailors on the Niña, Pinta, and Santa Maria did know from experience that
healthy seaweeds floating in the water meant rocks in the near vicinity! At least that had always before been the case.

The fleet of small, square-rigged vessels bearing Columbus and his men westward from the Canary Islands was being blown "downhill" by the prevailing, strong easterly winds at that latitude [the trade winds]. Columbus, who was a widely traveled mariner, knew about those winds and planned to use them for a fast downwind passage to the East Indies, the location of which he also was sure he knew. (He did know the latitude from observations made by the overland spice traders; it was the longitude that gave him trouble.)

The crew saw it differently. They were being blown inexorably away from their homes in vessels that, as square-riggers, could not turn about and make headway back into the wind. How would they ever get home? How long would their provisions last? Or would their end come soon, shipwrecked on the rocks the seaweeds promised?

Unlike their admiral, they had not moral certainty about good things ahead (September 20, twenty-two days out): "And we saw much weed of the kind I have already mentioned, even more than before, stretching to the north as far as you can see. In a way this weed comforted the men, since they have concluded that it must come from some nearby land. But at the same time, it caused some of them great apprehension because in some places it was so thick that it actually held back the ships. Since fear evokes imaginary terrors, the men thought that the weed might become so thick and matted that there might happen to them what is supposed to have happened to St. Amador when he was trapped in a frozen sea that held his ship fast. For these reasons we kept as clear as possible from those mats of weed."

The explorers were now far enough away from home (as I see it) that in the minds of the sailors the danger of wrecking on rocks began to lessen before the greater danger of never finding land. Apprehension remained strong and fostered a new worry, that of entrapment by seaweed. Real entrapment of the vessels was, of course, not possible; but in light winds, the Sargassum [which sticks some of its branches above the water and blows somewhat with the wind] probably moved downwind at about the same speed as the beamy, blunt vessels, which therefore did not make much visible passage through it.

One of the characteristics of Columbus that appears and reappears throughout the log is his ability to talk with his men, give reasonable explanations of things from his store of experiences, and calm their fears. Columbus was able [though barely at times] to overcome whatever fear the Sargassum engendered among the men and to talk them out of mutiny.

Every few days from September 21 to October 3, Columbus says something, but not much, about the floating seaweed; either it is abundant or scarce. By now (a month out) it must have been clear to all hands that the Sargassum of the Sargasso Sea does not mean either land ahead or rocks nearby.

On October 3, a new element arises: "There is more weed, but it is withered and appears old. There is a little fresh weed that bears something like fruit."

Here is my interpretation of that entry. First, the Sargassum was not doing well. Perhaps it was not the same kind of Sargassum as that typical of the Sargasso Sea. Sargassum exists in many species [some fourteen in the tropical Americas]. Only two of those species account for the floating, healthy Sargassum of the Sargasso Sea. All the remaining species are found solely as typical attached seaweeds of the shore, and they soon die if torn free in a storm. Perhaps the fleet had newly encountered some of these attached kinds ripped by a storm from the fringes of the Caribbean islands, where they are common, withering and dying as they floated about.

Second, a new seaweed of about the same color [or Columbus would probably have noted the difference] had appeared in the drifting Sargassum. It bore "fruit" different from
the small, spherical bladders of Sargassum (or he would not have noted them specially in the log). This weed was "fresh." I think Columbus probably found some Turbinaria with its heavy, somewhat pear-like tips, among the withered "island" Sargassum. Turbinaria will not grow unattached, but it does remain alive longer than most tropical seaweeds when torn free from its substrate. Did the combination of withered old Sargassum and fresh, different weed finally mean land ahead?

On October 8 comes this entry: "Very fresh weed has been seen." Then, late on October 10, landfall was made. Ultimately, the seaweeds were right. Land was ahead.

Was the evidence of the Sargassum "wrong" at first? No. Christopher Columbus was the first person to record a new life form of seaweed, one that lives, grows, and reproduces afloat at sea and nowhere else. Only two species of Sargassum (S. natans and S. fluitans) have evolved that ability. Unlike their relatives at the shore's edge, these species have become unusually efficient at absorbing and recycling nutrients while drifting with the oceanic surface water masses. They have facilitated the evolution of a complex community of animals and microscopic plants that attach or shelter among their branches, aiding in the capture and recycling of nutrients from what is, au fond, a desolate and impoverished source.

Having adapted to an unusual niche in which no other seaweed has been able to compete, those two species of Sargassum have given up the sexual reproduction characteristic of shore-based species of Sargassum. Instead, they increase solely by vegetative means. A branch grows by active cellular division at the tip. As the plant ages, the cells at the other end of the axis eventually die and disappear. The amount of plant material existing at any one moment thus reflects the consequences of a race between the amount of tip growth and the rate of death catching up from behind. Occasionally a tip develops into two branches, creating a branching point in the axis behind. When death catches up with that branching point, two separate plants appear where there was but one before. The size of the population measured by numbers of individuals in this way is also determined by a balance between growth and death.

Over the past five hundred years, growth and death of Sargassum have been in relatively good balance. The log entries describe a Sargasso Sea of patchy nature—no weed some days, dense mats or windrows on others. That is the way it still is; although, as shown by studies aboard SSV Westward, weathered petroleum and plastic granules permeate all of it now, and some evidence suggests that the Sargassum is not as plentiful as it was when Columbus first described it five centuries ago. Nevertheless, we still do have the Sargasso Sea. Moreover, John Teal of the Woods Hole Oceanographic Institution has noted that, by the nature of this process, some of the Sargassum out there now, which is in a sense immortal, must have seen Columbus pass by.

In Botany, Columbus Was "Dismal"—Or Was He?

A recent, well-received colloquial English (American) translation of the log of Columbus' first voyage (1492–1493) is that by Dr. Robert H. Fuson (The Log of Christopher Columbus, 1987; International Marine Publishing Company, Camden, Maine). In a comment on page 34, Professor Fuson assesses Columbus in the following words: "In summary, the log tells us much about Columbus the sailor, the scientist, and the captain. As captain/sailor he was unsurpassed. As a scientist, he lacked much, especially in botany (dismal!), ornithology (only fair), and ichthyology (poor). In other sciences he was better: astronomy (good), meteorology (better than average), navigation (A plus), ethnology (good), geography (excellent)."

In a similar vein, L. A. Vigneras says of Columbus in a foreword to Cecil Jane's earlier familiar translation of Columbus' journal: "His knowledge of flora and fauna was limited and most of his identifications of trees and plants are only approximate."
The few writers on Columbus, such as Robert H. Fuson and Samuel Eliot Morison, who have immensely valuable, practical first-hand knowledge of the sea and the lands that Columbus explored as well as the academic tools and abilities to review his writings critically, appear, nevertheless, to have lacked the professional expertise needed to assess closely the botanical entries themselves. Fuson gives no specific credit for his botanical treatments, but has certainly sought informed help in writing his addendum on plant tubers as well as many of the footnotes. Morison credits several of Harvard’s eminent plant specialists for his botanical names and comments. Despite this collaboration of experts, botanical misunderstandings have occasionally occurred and useful insights have escaped capture in the most widely read accounts of Columbus’ first voyage.

Columbus himself was the first to admit that he didn’t know much about plants. He notes about a week after the first landing (October 21): “I am the saddest man in the world for not knowing what kinds of things these are because I am sure that they are valuable.”

As expressed to Queen Isabella and the king, Columbus proposed to attempt three things in 1492: first and foremost, to find a direct water route to the exceedingly valuable spices of the East Indies; second, to find wealth; and third, to bring Christianity to the natives. Although gold was the name of the
game when Columbus returned home in 1493, spices were a major objective when he set forth. Let us then look at the matter of spices, broadening that definition a little to include as well drugs, herbs, and other plant extracts of high value.

The most valuable spices that came only from the distant east in the time of Columbus were pepper, ginger, rhubarb, cardamom, cinnamon, nutmeg, mace, and perhaps cloves. We know for sure that Columbus was seeking at least pepper and cinnamon because he says, on November 4: “I showed samples of cinnamon and pepper, which I had brought with me from Castile, to some Indians.”

The Wrong Kind of Aloe

The first thing Columbus found, however, that he thought he recognized was not one of the precious spices, but what he called “aloe.” On October 21, about a week after the first landing, Columbus records: “I recognized the aloe here, and tomorrow I am going to have one thousand pounds of it brought to the ship because they tell me that it is very valuable.”

The next day: “I have taken as much aloe as I could find.” And on October 23: “And I know nothing except this aloe which I am carrying to your Highnesses in great quantity.” Unfortunately, he didn't find the “right” aloe (Aloe barbadensis), the one he had probably known in the Mediterranean region from which he came (Figure 4). A. barbadensis didn't grow in the New World in 1492, though it is common in the Caribbean now.

Today the principal use of Aloe barbadensis is in skin conditioners and similar cosmetics. As a home remedy, the mucilaginous “pith” of the leaf is commonly used to soothe burns. In the fifteenth century, A. barbadensis had a different, more important use. The yellow sap that drips from the cut leaf was collected, dried, and used in small doses as a potent laxative. It will cleanse the human gut quickly and thoroughly.

If not Aloe barbadensis, what did Columbus actually find? The common Caribbean plant that looks superficially like aloe is an agave or century plant: Agave missi-

num, A. bahamense, and perhaps others. While these agaves are distinctly larger than aloe and the leaves not as fleshy, leaf color, shape, and the general appearance of the agaves and aloe are quite similar (Figure 5).

That the local “aloe” was larger than the European aloe did not trouble Columbus overmuch if he noted and wondered about it. Because he arrived in the West Indies during the rainy season, Columbus found everything lush and green. He saw open fields of tall, luxuriant grasses that at home would have been eaten down by cattle, horses, sheep, goats, and the like—while on these islands there were no large herbivores at all. The forests had not ever been cut and the size of the mature trees impressed him greatly. His log entries frequently display a feeling that everything is and ought to be generally larger, more lush, more showy, or more fragrant in the New World than at home. That the Caribbean aloe was bigger was quite reasonable in this context.

Perhaps some of the enthusiasm embedded in Columbus’ comments was aimed at selling Isabella on his discoveries—mild hype is understandable in the circumstances, and must have been effective, because the Spanish crown furnished Columbus with seventeen vessels and some twelve hundred men on royal salary for his second expedition to the New World in late 1493. Even so, much of Columbus’ enthusiasm was clearly genuine and entirely supportable.

Columbus mentions aloe six more times in the log from November 5 to January 7. His enthusiasm for it had clearly decreased over that period because in each of those six entries he mentions it only in passing. For example, on November 7: “There is a lot of aloe but it is the mastic that is worth paying attention to . . .”

Aloe is not among the materials Columbus listed as being removed from the Santa Maria, after she foundered on a reef near Cape Haitien on December 26. One wonders if his half ton of fresh century plant in the hold had
begun to mold or ferment in the warm, moist maritime air and had been heaved out long since.

Columbus rarely if ever admits in the log of having made a mistake, but that and a great deal of other evidence suggest that neither did he ever alter an entry in the log once it had been made. In this instance and in several others, we see glimpses of a progression from enthusiastic but uninformed certainty, to doubt, to no further mention—admission in his own mind if not on paper that things weren't exactly as he first thought.

**Mastic from Gumbo Limbo**

What was the "mastic" that was more desirable than the "aloe"? Before the epic voyage of 1492, Columbus had visited or lived for a time on the island of Chios, off the Greek mainland, then politically a satellite settlement of the city-state of Genoa, where he probably was born. That gave him an opportunity to become familiar with the growing and harvesting of mastic. Chios at that time was the primary, perhaps sole, source of the highly valued mastic resin. European mastic is a yellowish resin that bleeds as occasional "tears" from the bark of *Pistacia lentiscus*, the mastic tree. It can be harvested more copiously if the bark is scored with a knife.

Columbus makes brief mention of mastic first on October 17: "[Another] had leaves like mastic ..." He identifies it definitely on November 5, about three weeks after the first landing. That day and the next two he gives it lots of attention (four lengthy entries) including the following:

While the *Niña* was beached, its boatswain came to me to beg a reward for finding mastic. But he did not bring a specimen because he had lost it. I ... sent two men to the trees, and they brought a little of it, which I kept to carry to the Sovereigns. I also kept some of the tree, for I knew that it was mastic. Although it must be gathered at the right time of year, there is enough in this vicinity to produce fifty tons a year.

But it is the mastic worth paying attention to, for it is found only on Chios and they derive over fifty thousand ducats a year from it, as I recall. Although

the leaves and fruit of this tree appear to be those of *P. lentiscus*, the tree here is much larger than the trees on Chios. I ordered many of the trees tapped in order to get resin. I could only get a little bit since it has rained every day, but I am bringing it to Your Highnesses. Also, it may not be the season to tap them. I think it should be done after winter, just as they are about to flower. Here the fruit is almost ripe.

Nor is that the end of it. Eight more entries appear that mention mastic: one in November, three in December, and four in January. Columbus didn't lose his enthusiasm for mastic resin the way he did for aloe, but he couldn't get any significant amount from the trees, and he explains, quite reasonably, why that is so. His later references pay passing attention to the abundance of mastic trees (which the crews gathered as firewood), but the evidence suggests he gave up trying to obtain financially significant amounts of the resin to take back to Spain.

What was the New World mastic? *Pistacia lentiscus* did not grow in the Caribbean area when Columbus arrived. Undoubtedly Columbus' "mastic" tree was *Bursera simaruba* (Figure 6), which today is variously called gumbo limbo, gum elemi, turpentine, birch gum, or tourist tree in the English-speaking Caribbean islands—the last because its trunk is always red and peeling. Among the several uses of European mastic was treatment of diarrhea, and the New World Indians told Columbus that the resin from their tree was good for stomach pains.

Given Columbus' proclivity to believe everything was bigger and better in the New World, who can blame him for this mistaken identification? Would the average American tourist have done better?

**A Case of Mistaken Identity**

On the very first day after landing, Columbus saw something no white man had ever seen before; on November 6, just three weeks later, he realized what it was. October 12: "[The Indians] brought us ... many other things, including a kind of dry leaf that they hold in great esteem." October 16: "Also, he had ... some of those dry leaves which are much
valued by these people, for they brought some
to me on San Salvador as a gift.” November 6: “My two men found many people who were
going to different villages, men and women,
carrying a charred hollow wood in their hand,
and herbs to smoke in this wood, which they
are in the habit of doing.”

The herb was, of course, tobacco. The word
tobacco is Arawak, the native language of
these island tribes. The charred hollow wood
in which it was smoked [through the nostrils]
might have been a small pithy branch from
Cecropia peltata (trumpet tree) with the pith
reamed out, or a piece of a bamboo-like cane,
several kinds of which are native to the
American tropics.

We can, now, perhaps deduce what it was
that Columbus mistook for cinnamon. November 4: “[Martin Alonzo] Pinzón came
to me with two pieces of cinnamon and said
that a Portuguese sailor on his ship had seen
an Indian who was carrying two very large
handfuls of it . . . The boatswain of the Pinta
said that he had found trees of cinnamon. I
went to see for myself and found that it [the
trees] was not cinnamon. I showed samples
of cinnamon and pepper, which I had brought
with me from Castile, to some Indians [who]
recognized these spices and indicated by signs
that there was a great deal of it nearby.”

November 6: “My men showed the Indians the
cinnamon and pepper and other spices I had
given them, and they were told by signs that
there were many such spices nearby . . . but
they did not know if they had those things in
their own village.”

What would an Indian be carrying “two very
large handfuls of,” that looked like cinnamon?
True cinnamon (Cinnamomum zeylanicum) didn't grow anywhere in the New World when Columbus arrived. Cinnamon spice is the thin brown bark peeled off young branches of the cinnamon bush. The bark from small branches tends to roll up into tubes or cylinders. Coarse tobacco leaves also tend to roll up and turn brown as they dry. I suspect the Indian was carrying two handfuls of tobacco.

Columbus was doubtful about the identification of cinnamon bark from the first, as he reports it as hearsay from Captain Pinzón (whom he didn't particularly trust), who in turn lays it to “a Portuguese sailor.” He was certain the identification was wrong when he went to see the trees themselves. Note that no further entries about cinnamon appear in the log after those two. Even the Indians were doubtful that they had cinnamon, telling Columbus [as usual] what they thought he wanted to hear (that there was plenty nearby), while admitting that they didn't know if it was to be found in their own village. Score another botanical point for Columbus!

**Pepper by Another Name**

The spice Columbus was most anxious to find was probably pepper. True pepper (Piper nigrum) was imported to Europe from its native Asia and India in Columbus' time and was paramount in importance among the imported spices. Old World black pepper, distributed as peppercorns, is prepared from the green berries of the pepper vine (Figure 7). The berries are harvested, fermented a little [thus blackened], and then dried. White pepper consists of the same berries picked a little later [ripened a little more], soaked in water, and rubbed to remove the outer layers, thereby yielding a hard, gray peppercorn.

As can be seen in the log entry for November 4 (see cinnamon), Columbus was actively seeking pepper, but despite what the Indians told him about its being plentiful nearby, he never found anything he believed to be Old World black or white pepper. He did experience something with a similar pungent taste which the Indians used copiously in their stews. Just when this first happened is not determinable, but after the Santa Maria grounded, Columbus dined with the Indians regularly and surely ate frequently from the Arawak pepper-pot stews. On his very last day on land in the New World [January 15], Columbus writes his sole entry about pepper in the log: “There is also much aji, which is their pepper and is worth more than our pepper; no one eats without it because it is very healthy. Fifty caravels can be loaded each year with it on this Isla Española.”

The New World peppers are species of Capsicum. These plants grow as herbaceous shrubs and produce the familiar red, yellow, and green peppers of the vegetable garden. The fruits range widely in hotness and the two common species have many varieties. Capsi-
cum annuum includes the bell, pimento, paprika, chili, and red or cayenne peppers. Capsicum frutescens includes the tabasco peppers. The Arawaks used the dried fruits of one or the other both as a spice and also for preserving foods. They have been shown to have antibacterial, and perhaps antioxidant, abilities.

American peppers are one of the most important gifts of the New World to the Old. Columbus deserves credit not only for realizing that our peppers were something quite different from the peppers known in the Old World, but even more for recognizing their potential value. He deserves credit, also, for describing the New World pepper situation accurately in his log.

Although Columbus made several world-shaking discoveries on his first voyage, he actually found not one of the spices he was after. Sublime irony lies in the fact that, in seeking a fast route to the “pepper islands,” Columbus got the wrong islands, named the wrong Indians, and found the wrong peppers.

Until his death, Christopher Columbus believed that he had found the right islands, but from his very first encounter with it he knew he hadn’t found the right pepper. One could conclude from this superficial assessment that Columbus’ botany was brilliant, while navigation and ethnology were the studies in which he was “dismal.”

In Keeping Alive, It’s the Starch That Counts

The islands of the Caribbean had been settled, over the period of a millennium or so, by agricultural Indians who had worked their way in large dugout canoes from northern South America to Trinidad, and then, island by island, north and west to Cuba and the Bahamas. These Indians carried their principal food plants with them as they migrated. They called themselves the Arawaks, a word which, I have heard, means the “tuber eaters.” Certainly two root crops that they carried with them in the canoes were among their most important staples.

Figure 8. Local Caribbean “bread,” made from cassava tubers, Manihot esculenta.

When Columbus and his men arrived in the New World in October of 1492, their fresh provisions were largely exhausted. Although finding spices was officially a top objective of the expedition, of practical necessity Columbus took an immediate overriding interest in what the Arawaks were eating and in trying these new foods himself. October 14: “Some brought us water; others things to eat . . . Many men and women came, each one with something.” October 16: “He carried a bit of bread about the size of your fist.”

Columbus soon realized that the native bread (Figure 8) was made from tubers, but he had a lot of trouble identifying or describing them. At various places and times in the log, he compares the Arawak tubers with carrots and radishes, yet clearly he recognized that the Arawak tubers were neither carrots nor radishes. In appearance, he found them more like certain large tubers he had experienced on his voyages to northern Africa. In the African tongue, those tubers were called, as transliterated, niames. Thus on November 4 we find: “These lands are very fertile. They are full of niames, which are like carrots and taste like chestnuts.” And on November 9: “The roots that taste like chestnuts are their principal food, and much land is planted to it.”
In mid-December Columbus had occasion to learn quite a bit more about the Arawak tubers and how they were grown. December 13: “They brought the bread of *niames*, which are tubers and look like large radishes. They are planted in all their fields and are their staff of life. They make bread from them and boil and roast them, and they taste like chestnuts—anyone who eats them will say they taste like chestnuts.” December 16: “These fields are planted mostly with *ajes*. The Indians sow little shoots, from which small roots grow that look like carrots. They serve this as bread, by grating and kneading it, then baking it in the fire. They plant a small shoot from the same root again in another place, and once more it produces four or five of these roots. They are very palatable and taste exactly like chestnuts. The ones grown here are the largest and best I have ever seen anywhere.”

Altogether, Columbus refers to bread or tubers in well over a dozen log entries. In these entries, the Arawak word for the tubers (*ajes*) replaces the word Columbus first used for them (*niames*) on December 16, and *niames* does not appear in the entries after that date. This seems clear evidence, if such were needed, that Columbus never exactly equated the New World tubers with the African *niames*, but merely used that word for lack of a better one until he learned the Arawak word. By late December Columbus had learned the Arawak word for the bread made...
from aje tubers. The log for December 26 notes: "And other foods they have, including their bread, which they call cazabe."

A Niame by Another Name

The Arawak tubers were two: Ipomoea batatas, the sweet potato of the morning glory family (Convolvulaceae), and Manihot esculenta of the spurge family (Euphorbiaceae) (Figure 9). The latter and its products possess several names in English, principally manioc, cassava, and tapioca—all three words are transliterations of Indian names.

If Columbus was confused about the Arawak tubers, it was only in how many kinds there were. At first it seems he did not differentiate between the sweet potato and cassava. As time went on, however, he undoubtedly saw both as they grew in the Indian fields. While their tubers are grossly similar, the plants themselves could hardly be more different. The sweet potato grows as a compact, ground-hugging, viney plant—something like a squash, with small, pinately veined, pointed leaves. Cassava plants (as Columbus notes on December 16) start as erect shoots that eventually grow into long-stemmed, upright, head-high, almost woody plants with large, long-stalked, palmately veined and divided leaves. Even a dismal botanist could not have confused these two plants as one.

On December 26 (just after the Santa Maria grounded on a reef), Columbus records that he has eaten with his Indian hosts "a meal with two or three kinds of ajes ... Today, both cassava and sweet potato exist in many horticultural varieties, including different flesh colors among the sweet potatoes; and it is likely that, in the millennium during which the Arawaks had been island hopping, they had already established several selections of each species with differing tuber characteristics. Thus, Columbus could easily have had several varieties of ajes at the Indians' table.

The flesh of the cassava tuber is poisonous if eaten raw. Its toxicity comes from the presence of a glycoside that releases cyanide (HCN) when eaten. The cyanide potential in the raw tuber depends partly on genetics and partly on growing conditions. Somewhat loosely, the "sweet cassava" varieties are genetically of low toxicity, while the "bitter cassavas" usually are highly toxic. Small quantities of sweet cassavas can be eaten raw with little risk (though they can become fairly toxic under certain conditions of growth), but bitter varieties should never be eaten raw, even in small amounts.

The Arawaks had, of course, learned all about these properties of cassava. They used bitter cassava as a source of spear poisons. They routinely detoxified the cassava they ate. Fortunately, cyanide is easily destroyed by simple treatments of the raw tuber, even if present in high concentration. Cooking (boiling or roasting) is always effective. Cassava tubers were typically cut into pieces and cooked in the ubiquitous pepper pot of the Arawaks. The other usual method of detoxifying cassava was to make it into bread in the way Columbus himself described. The juice is squeezed out of the scraped and kneaded pulp, and the dough thus prepared is baked in a fire. The common method was to spread it in a thin layer on a hot flat stone or a pottery wheel made for the purpose. Modern cassava bread is prepared in a similar way.

These tubers, the sweet potato and the cassava, were the staples of Indian life, their primary source of carbohydrates. The Spanish sailors had to accept them when their supplies of boat provisions ran out. Like most people, they preferred familiar foods to something new. On subsequent voyages to the New World, Columbus (and others) brought seeds for growing European grain crops. None grew well, if at all. Subsisting on native tubers was a source of dissatisfaction to the conquering Europeans and was seminal in generating the unrest, insubordination, and downright mutinous behavior that often prevailed in the early sixteenth century.

But subsist on tubers the Europeans did when nothing else was available. On the return leg of the first voyage (January 13): "I
sent the men ashore to get some ajes to eat." January 15: ". . . and many other men came with cotton, bread, and ajes." Thus were the Niña and the Pinta reprovisioned. They departed Hispaniola before dawn on January 16. When these two tiny vessels eventually reached Spain after weathering a severe storm and other difficulties, some of the sweet potato store was still sound. These sweet potatoes were planted locally, and this act constituted the initial introduction of *Ipomoea batatas* to Europe.

**Beans and Gourds**

The only European food bean in the time of Columbus was the broad bean of the Mediterranean region (*Vicia faba*). Columbus probably knew this one bean when he left the Canaries. On November 4, about three weeks after the first landing, he writes in his log: "They [the Arawaks] have beans very different from ours . . ." Two days later: "The land is very fertile and well cultivated with those niames, beans very different from ours, and panic grass."

The "very different" beans Columbus found were *Phaseolus vulgaris*, now selected and bred into such varieties as navy beans, pea beans, kidney beans, green and yellow string beans, French horticultural beans, Kentucky wonders, and so forth—another major gift of the New World to the Old. Columbus was accurate in observing that the New World beans are very different from those of the Old World.

The Arawaks carried these New World beans, as well as corn and squashes, from South America with them as they migrated. Columbus never once mentions squashes (*Cucurbita* spp., *Lagenaria* sp.) by that name in the log, but surely does note them under gourds on December 3: "I climbed a mountain and came to level ground, which was sown with many different crops and with gourds!" New World species of *Cucurbita* can be used as utensils when the squash skin has been cleaned out and dried. They also can be eaten as vegetables when fresh. The cultivated

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**Figure 10. The calabash or wild gourd tree, Crescentia cujete.**

"gourds" that Columbus saw were squashes and not those described next.

There are six entries on gourds in the log, scattered from the day after landing to late December. Beyond the one just quoted, the other five entries have to do with an entirely different kind of gourd, one used for carrying water. On October 13, for example, when Columbus was watching the Indians right an overturned dugout canoe, he notes: "Then they bail out the rest of the water with gourds that they carry for that purpose." And in another entry, on December 21: "They also brought us water in gourds and in clay pitchers shaped like those of Castile." The gourds the Arawaks used principally for carrying or storing water were undoubtedly from the wild calabash tree (Figure 10) or wild gourd tree (*Crescentia cujete*). These native
Caribbean implements are still used for bailing and are definitely less damaged by prolonged contact with water than is a squash gourd. They are also usually more nearly spherical and larger, and are not cultivated or used for food.

**Corn, Of Course**

Columbus never mentioned corn (maize) as such in the log either, but we can be quite confident he saw it. The best clue lies in the entry quoted above, which mentions the cultivation of “panic grass.” The actual Spanish word for the latter is *panizo*, and is perhaps best understood as meaning any tall, coarse, broad-leaved grass.

The corn, *Zea mays* (whose species name is from the Indian *mahiz* and becomes *maize* in English), of the Arawaks was not the highly selected and carefully bred plant we know today. Instead, it was a waist-high, broad-leaved grass with extending sparse tassels and separate heads of grain hidden below, among the leaves. These heads of grain were small, and the grains themselves somewhat similar to today’s flinty popcorn kernels.

Knowing that, and remembering the absence of large herbivores on the island, the reader of the log can understand better some entries, such as that of December 6: “... beautiful fields... all cultivated, or at least a large part of it, and the crops look like wheat in the month of May in the vicinity of Cordoba.” Or December 7: “... a very large valley. It was all sown with something resembling barley, and I thought there must be a large [human] population.” There was no wheat nor barley, nor any other cultivated, large coarse grass except corn on the islands Columbus visited. He definitely found corn, perhaps the greatest gift of all from the New World to the Old.

**Cotton and Kapok**

On the same day he first observed Arawak beans (November 4), Columbus also made another discovery: “They have beans very different from ours, and a great deal of cotton, which they do not sow and which grows in the mountains to the size of large trees. I believe that they can gather it any time, for I saw pods already open and others just opening, and flowers all on one tree.” Can we really believe Columbus saw cotton growing on large trees?

At the time of Columbus, cotton was well known in the Mediterranean region. It was obtained from *Gossypium arboreum* and *G. herbaceum*, of Africa and Asia. These cottons were like the New World cottons except that the fiber length [staple] was shorter. Columbus should definitely have known cotton (the white fuzz) when he saw it.

New World cotton is obtained from *Gossypium hirsutum* and *G. barbadense*. These are distinctly long-staple cottons (which agreed with Columbus’ concept that everything is bigger and better in the New World). Although the Arawaks didn’t sow cotton
annually, they did transport it to and among
the islands with them. They traded from
island to island regularly in their canoes. If a
naturalized cotton thicket gave out, they
could easily reintroduce it from the next
island over.

The Arawaks had learned to spin and weave
cotton. They also made hammocks from it
(the word hammock is of Arawak origin).
Columbus was much impressed. He writes
about cotton nineteen times in the log. Here
are a few representative entries. October 12
(the day of the first landing): "They brought
us . . . balls of cotton thread." November 4:
"Today many canoes came to the ships to
trade things made of spun cotton, including
the nets in which these people sleep called
hammocks." November 6: "[The ships' crews]
saw a great quantity of cotton that had been
gathered and spun and worked—in one house
alone more than twelve thousand pounds of
it. Two hundred tons could be had there in a
year. I have already mentioned that they
apparently do not plant this cotton and that
it bears fruit all year. It is very fine and has
a large pod . . . It is true that the women wear
a cotton swatch only large enough to cover
their private parts and no more."

One of the European cotton plants (G.
arboreum) grows into a larger bush than either
of the common New World species of Gos-
spyium. This seemed to violate Columbus'
idea of "bigger and better" in the New World.
But then he found "large trees" of cotton. Did
he make up this entry to satisfy the "bigger
and better" doctrine? I think not. Columbus
probably found some mature kapok trees
(Ceiba pentandra). These magnificent
smooth, gray-barked trees (Figure 11) with but-
tressed bases can reach up to 45 meters (150
feet) or more. They bear copious quantities
of cotton-like pods with cotton-like (though
grayer) fuzz within, the source of the kapok
used in life preservers before the advent of
man-made fibers for that purpose. The Ceiba
tree is generally called the silk-cotton tree in
English-speaking Caribbean areas, and most
people would undoubtedly think it was
another kind of cotton if they saw only the
pods and the fuzz from each. Five centuries
ago people had concepts about "kinds" of
plants, not genera and species or genetic rela-
tionships. Columbus was lumping in the word
cotton two closely similar kinds of pods and
fuzz, one from bushes, the other from trees.
Perfectly reasonable.

A Botanical Oddity
Of all of the plant entries, the one that most
predisposes people to think that Columbus'
botany was dismal comes early in the log, on
October 17: "Many of [the trees] have branches
different kinds, all on one trunk; one twig
is of one kind and another of another, and so
different from each other that it is the greatest
wonder of the world. For example, one branch
has leaves like cane, another like mastic; thus
on one tree five or six kinds, and all so differ-
ent. Nor are these grafted so that one can say
the graft does it, for these trees are right there
in the woods, and the people do not take care
of them."

This makes one think of early medieval
times and of herbals with drawings of plants
bearing human arms and legs, does it not?
What could Columbus have seen that could
come even near to this description? For a per-
son who looks at trees while visiting the
Caribbean islands even today, the answer is
not difficult. It consists of three parts.

The first is the phenomenon of juvenile
foliage. Sometimes when a tree is injured it
will respond by budding forth branches that
bear leaves of a different size (often larger) or
shape from the mature leaves. These are the
same kind of leaves that are characteristic of
seedlings of that species, but may look
startlingly different when they appear among
the mature foliage of a large tree.

The second is the ubiquitous presence
of the green, woody, parasitic mistletoe
(Phoradendron spp.) on tree hosts of all
descriptions. On anything but the closest
examination, the mistletoe branch appears to
grow directly as a lateral from the host branch.
Usually the leaves of the mistletoe are dis-
tinctly different from those of the host in color, size, shape, placement, and the like, and we have a tree ostensibly with two conspicuously different kinds of branches.

The third type of "different branches" one sees in the Caribbean is the epiphyte. When Columbus visited in 1492–93, the island forests were better provided with mature trees, denser in the foliage canopy, richer in species, and more like a true rain forest than the impoverished and exploited remnants existing today. These forests conserved moisture better too, creating high humidity among the tree tops, and the opportunities for epiphytes to grow in bark crevices high in the branches were more numerous. One can envisage Columbus looking up into such a tree and seeing a bromeliad with grasslike strap leaves, or an autograph tree seedling (Clusia rosea) with large, heavy leaf blades contrasting with the foliage of the host while appearing to grow forth from it.

Did Columbus see trees with five or six different kinds of branches? Perhaps he exaggerated a little, but a single tree with three or four apparently different kinds of branches is not at all unrealistic.

I conclude that, although Columbus' botany was uninformed, his observations were accurate, his descriptions were excellent, his conclusions were mostly correct (discounting a little hype for the queen), and that he was willing to admit occasional mistakes, perpetrating them no further once recognized. My knowledge of the admiral has increased significantly as a result of this little study. My admiration for him has increased even more.

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