

The Middle East and the Age of Discovery



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Front cover: Reaching from Spain, at the one-o'clock edge of the globe, to Florida in the 10-o'clock direction, and from the West African coast at upper right to the coast of South America, the Atlantic Ocean's vast and daunting expanse demanded special courage from those who ventured onto it – the seamen and explorers who prepared and undertook the westward portion of the Age of Discovery. The *Apollo 15* crewmember who took this photograph from more than 25,000 miles up could see almost half the globe, including Cuba and the Bahama Banks, the Strait of Gibraltar and the Sahara, the Andes, the Canaries and the Azores; 500 years ago, from the tip of the *Santa Maria's* mast, Columbus's crewmen could see at most 20 miles in any direction. Photo: NASA. **Back cover:** Muslim scientists work in an observatory-library equipped with a number of astronomical and navigational devices, including a globe that shows, southwest of Africa, the bulge of the coast of Brazil. The miniature is from a 16th-century Ottoman edition of the *Shah-Nama* in the Istanbul University Library. Photo: Roland and Sabrina Michaud. **Inside front cover:** Ptolemy's world map, from a 15th-century manuscript in the Bibliothèque Nationale, shows the inhabited world as it was known in the second century of our era.

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Historian and Arabist Paul Lunde, author of the whole of this issue of *Aramco World*, is a frequent contributor to the magazine with some 50 articles to his credit over the past two decades, including special multi-article sections on Arabic-language printing and the history of the Silk Roads. His immediate

research for this issue was carried out in Seville, Rome, London and Cambridge, and he wrote from his base in Seville's Barrio de Santa Cruz, a stone's throw from the city's cathedral – once a mosque – and from the Alcázares Reales, the Moorish palace complex that remains today one of the residences of Spain's Christian kings.

It was, of course, from Portugal and Spain, and particularly from Seville, that the voyages of the westward Age of Discovery set out, but the intellectual spark that set off those world-changing ventures had been kindled long before and far to the east of the Iberian Peninsula. French economist and historian Jacques Attali, in his provocative book *1492*, describes that year as the beginning of the modern era, and so it was. But the hinge on which history turned was forged by the technical and philosophical achievements of the Muslim civilizations of previous centuries. This issue is about those achievements and their effects as the new era swung open – as well as about the Middle East's widening view of the New World.

For this special issue of *Aramco World*, Assistant Editor Robert Lebling added unusually extensive illustration research to his other duties, hunting productively and imaginatively for useful material from sources across Europe and the United States. Many museums, libraries, publishers, broadcasters, companies and individuals helpfully answered our enquiries and, in some cases, went to considerable effort to provide illustrations for this issue. Dr. Michael Ryan, director and librarian of the Chester Beatty Library in Dublin, greatly simplified the process of obtaining hitherto unpublished miniatures from the collection in his care. Mr. André de Clermont of Spink & Son in London was generous with information and in supplying photographs of coins. Through the National Aeronautics and Space Administration, Mr. Barry Schroder of TGS Technology at the Johnson Space Center in Houston participated with enthusiasm in the search for and selection of photographs from space. The staff of the Cambridge University Library were unfailingly helpful, and we also owe thanks to the following: Benson Latin American Collection, University of Texas at Austin; Beyazit Library, Istanbul; Biblioteca Nacional, Madrid; Biblioteca Colombina, Seville; Bibliothèque Nationale, Paris; Bodleian Library, Oxford University; Botany Libraries, Harvard University; Hamilton College, Clinton, New York; Historical Museum of Southern Florida, Miami; Houghton Library, Harvard University; Istanbul University Library; James Ford Bell Library, University of Minnesota; John Carter Brown Library, Brown University; Library of Congress, Washington; Museo de América, Madrid; Topkapı Palace Museum, Istanbul; and the Victoria and Albert Museum, London.

— The Editor

the Middle East and the Age of Discovery

There is a mysterious passage in Zakariyya al-Qazwini's *Athar al-Bilad* (*Monuments of the Countries*) which sticks in the mind because of its strangeness.

Yunan, writes al-Qazwini, using the old word for Ionia, was the birthplace of the Greek philosophers. "But now the sea has taken possession of it. Among its wonders is the fact that anyone who thinks of something in that land never forgets it, or at least remembers it for a long time. Merchants who have gone there by sea say that when they come to that place, they remember things they had forgotten. This is why it was the birthplace of those philosophers, whose like has rarely been found elsewhere."

For this popular 13th-century author, a slightly older contemporary of Spanish monarch Alfonso the Wise, writing at the time of the Crusades, the birthplace of Plato and Aristotle had little to do with the geographical area called Greece. Rather, it was a semi-mythical land of enhanced memory, cut off by the sea – a partial Atlantis, comparable to another island between the coasts of Yemen and Ethiopia that was said to possess a fountain of wisdom that cleared the minds of those who drank its waters.

Classical Greece was as remote in time to the medieval Arabs as the Atlantic islands were remote in distance. The Arabs' partial recovery of philosophical and scientific works from a culture so remote, so alien in outlook, was an effort of remembering, a voyage of the mind that – necessarily – both preceded and prefigured the voyages across open seas that led to the geographical discoveries of the 15th and 16th centuries – the era we call the Age of Discovery.

A fragile chain of transmission links us, in the West today, to the Greek roots of the philosophical and scientific culture that we share with the Muslim peoples. The chain reaches from Miletus on the coast of Asia Minor to Athens, loops through Alexandria and back to Rome, across Anatolia and through Iran to India, back again through Gondeshapur and Baghdad, west down the length of the Mediterranean to Córdoba, Seville, Granada and Toledo and thence to Sicily, Salerno and the university towns of medieval Europe.

This chain was forged by men of many different linguistic, cultural and religious backgrounds: pagans, Hindus, Jews, Christians and Muslims. They were alike only in their concern to find answers to the questions so simply and clearly formulated by the Greeks as early as the fifth century BC. What is the shape of the earth? How big is it? What supports it? Where does it stand in relation to the sun, moon and stars? How can we know our true location upon its surface? How can that surface be mapped?

The Greeks not only posed these questions but also answered them, insofar as they were able with the means at their disposal. When answers eluded them,

it was generally because they lacked the technology to answer them correctly.

In other cases correct answers were given, often very early, and subsequently rejected or simply forgotten. Aristarchus of Samos in the third century BC said, "The fixed stars and the sun remain unmoved, and the earth revolves about the sun on the circumference of a circle, the sun lying in the middle of the orbit." This description of the heliocentric solar system, made 2000 years before Copernicus, is cited in a work by Archimedes called the *Sand-Reckoner*; Archimedes says that Aristarchus combined this with the earth's rotation about its own axis, completing the model. The *Sand-Reckoner* is not included among the works of Archimedes that were circulating in Arabic translation in 10th-century Baghdad, but al-Biruni, writing in about AD 1000, refers to the heliocentric model quite casually, as if it were well-known, saying that although it was evidently the correct one, the

Ptolemaic, or geocentric, model was always preferred for theological reasons.

As much was forgotten as was remembered. This is particularly true in the history of geographical discovery. The Phoenician circumnavigation of Africa preceded the speculations of the earliest Greek philosophers by almost 100 years. Even Herodotus, who preserves the story, disbelieved it.

The discovery and "loss" of the Canary Islands is another example of how geographic knowledge – indeed, scientific knowledge in general – did not gradually accumulate, block upon interlocking block, as in the video game *Tetris*, but in fits and starts, often after long periods of inactivity or loss.

The number of times an effort was consciously made to "remember," to recover and then build upon the works of the ancient Greeks, is very small. Such an effort was made in Hellenistic times, in Alexandria, when the surviving works of the ancients were gathered together, catalogued and often commented upon. For our purposes, the major works that resulted

were Claudius Ptolemy's *Almagest* and his *Geography*. In these two books, Ptolemy attempted nothing less than to map the heavens and the earth.

The process by which Claudius Ptolemy became the Arabs' *Batlamiyus Kludiya*, and entered a completely alien linguistic and cultural universe, is of absorbing interest. In early ninth-century Baghdad, a conscious effort was made under the Caliph al-Ma'mun to produce Arabic versions of Greek scientific and philosophical works. The toleration that Islam extended to peoples with a shared scriptural tradition – "The Peoples of the Book" – meant that Muslim scholars who did not know Greek were able to benefit from direct contact with Christian scholars who did. Nestorian Christians who had maintained the traditions of the Alexandrian academy were attracted to the brilliant court in Baghdad. Here they

were safe from Byzantine persecution, and were able to meet Muslim and Jewish scholars avid for Greek learning. Some Arab scholars were able to master Greek and work directly with the original texts, or translate them into Arabic. Other scholars worked through the intermediary of translations from Greek into Syriac, prepared by Nestorian Christians.

There is hardly a work of Greek science or philosophy that was not available in Arabic by the mid-ninth century. Al-Hajjaj finished his translation of the *Almagest* in 826; the *Geography* may have been translated even earlier.

These two books established the framework within which astronomical and geographical researches were to be conducted for the next 700 years.

Ptolemy was not received passively in the Islamic world. From the very beginning, the *Almagest* and the *Geography* were subjected to very critical scrutiny. The observatories set up by al-Ma'mun were used to correct Ptolemy's star catalogue; the *Geography* was recast, coordinates re-calculated and hundreds of new observations added. His mathematics were sometimes violently criticized, amended and refined as new instruments were invented and more sophisticated mathematical tools became available. As more early Arabic texts are edited and published, the originality of the work of Muslim scientists and mathematicians becomes increasingly apparent.

The Arabic versions of Greek texts prepared in ninth-century Baghdad circulated throughout the

Islamic world. The translations were revised, commentaries were written upon them, and original works were composed that used the naturalized texts as points of departure.

This growing body of scientific literature, for the most part produced in little more than 100 years, found its way to western Islamic lands very early. Córdoba became a leading intellectual center in al-Andalus, or Muslim Spain, in the 10th and 11th centuries. When Toledo fell to the Christians in 1085, another effort was made to transfer the legacy of the ancient Greeks to another language, this time to Latin. In the early 12th century, Muslim, Christian and Jewish scholars produced a corpus of translations, from the Arabic, of the Greek authors and their Arabic commentators.

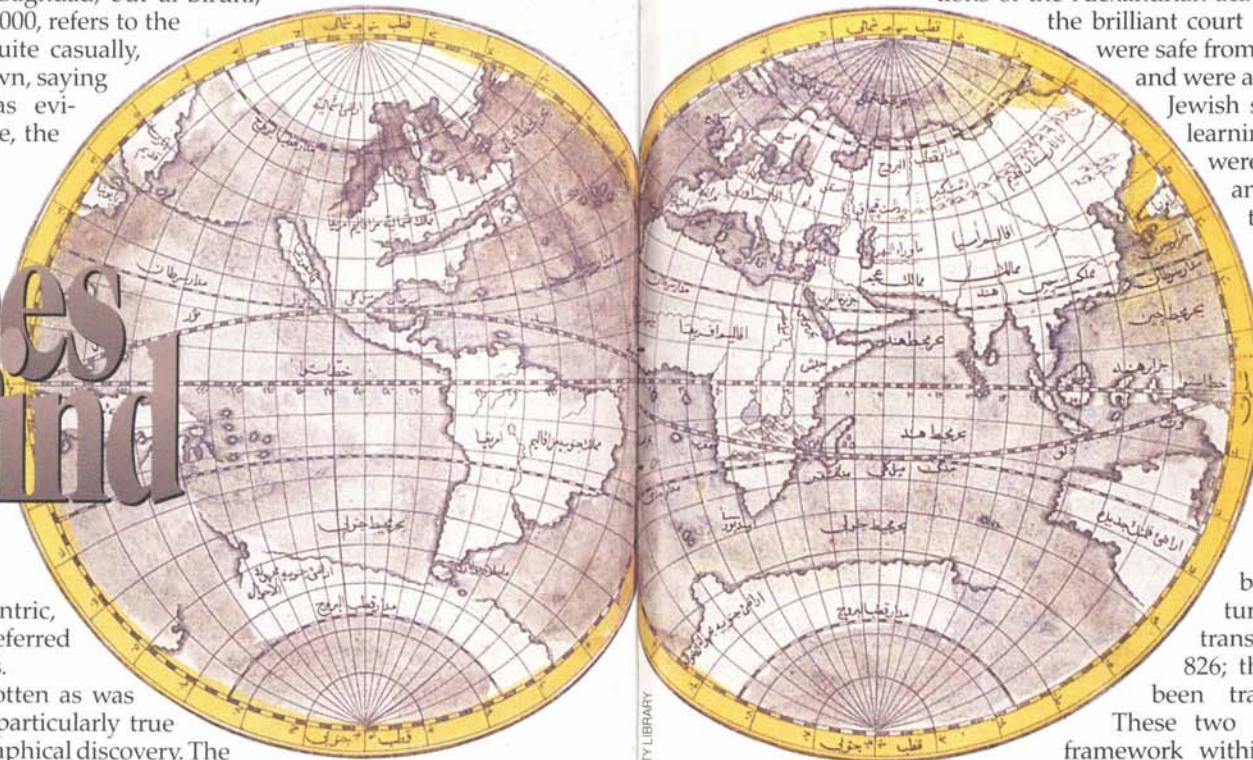
It was at this time that the works of Aristotle first reached the Latin West, with such enormous consequences for European intellectual history. Aristotle and his Arab commentators, Ibn Sina and Ibn Rushd – revered in the West as Avicenna and Averroes – became the point of departure for almost all European scientists and philosophers until the Renaissance.

The culmination of the transfer of Greek and Arab learning to the West was reached in the 13th century and occurred during the reigns of two European monarchs, who each ruled over formerly Islamic lands and over subjects of different faiths. Between them, Frederick II, Holy Roman Emperor and King of Sicily and Jerusalem, and his close relation Alfonso X of Spain almost span the century. Both men spoke Arabic and may have been able to read the classical language. At Frederick's brilliant court in Sicily, Muslim, Christian and Jewish scholars worked together. Men like Michael Scot translated Averroes; it was here that Leonardo of Pisa introduced Arabic numerals to Europe. Later in the century, Alfonso set up the first school of Arabic, under the direction of a Muslim scholar, in the newly conquered province of Murcia. This school was later transferred to Seville, which in the second half of the 13th century inherited the mantle of Toledo and became an active center for scientific research, particularly in astronomy.

Alfonso the Wise had literary as well as scientific interests. He sponsored translations of such famous Arabic works as *Kalilah wa Dimnah*, and his own *Cantigas de Santa Maria* are not only in the Arab metrical form known as *zajal*, but were set to pre-existing melodies of Arabic song. Both Frederick and Alfonso wrote comprehensive law codes, and it is difficult not to see the influence of the example of the *shari'a*, or Islamic law, in this concern for the minute regulation of relations among their subjects.

It is perhaps not surprising that the first European voyage of exploration we know of should have taken place against that background and in that century. In 1291, shortly after the death of Alfonso, the Vivaldi brothers, from Genoa, undertook a major expedition down the west coast of Africa, in an effort to find the sea route to the Spice Islands. They never returned,

Voyages of the Mind



A Turkish map of the eastern and western hemispheres, drawn after European sources by Ibrahim Muteferrika to illustrate Hajji Khalifah's *Jihan Numa*. Astronomical diagrams from the same book appear on these and the following two pages.



and how far south they reached is not known, but the very fact that they thought it possible to circumnavigate Africa means they had access to a non-Ptolemaic tradition, probably of Arab origin, for as we shall see, scholars like al-Biruni were certain the Atlantic and the Indian Ocean joined in the south.

Among the minor works of poet-historian Ibn Sa'id al-Maghribi – almost an exact contemporary of Alfonso the Wise, born in Granada, raised in Seville and widely traveled in the East – is a little geographical handbook. Based on Ptolemy, it is not very original, but it contains a certain amount of information about the coasts of Africa, western and eastern, not found elsewhere. Ibn Sa'id derived this information from Ibn Fatimah, of whom little is known except that he seems to have been a merchant who flourished around 1250. Ibn Fatimah's importance lies in his descriptions of places that were not reached by Europeans for another 200 years. He mentions the Cape Verde Islands, for example, but with a maddening lack of detail. On the east coast of Africa, he knows Madagascar and something of the coast opposite it. It is hard to know whether information of this sort reached men like the Vivaldi brothers and influenced them, but Ibn Sa'id's works were certainly well-known in Andalusia.

The 13th century also marks the appearance of the first portulan charts, extremely accurate mariner's maps of the Mediterranean, showing every cape and bay of the coastline. Distances are very accurate, and the length of the Mediterranean is almost exact – unlike the length given by Ptolemy. Their appearance coincides with the first widespread use of the compass, and they are normally provided with loxodromes, or rhumb lines, to find the correct bearing.

The existence of the portulan charts, which sometimes mark and caption "imaginary" islands in the Atlantic, is the perfect illustration of the survival, among mariners, of techniques of navigation and a practical science of map-making that owed nothing to Ptolemaic tradition and were much more accurate. These are the kind of maps Columbus and his brother Bartholomew made and sold for a living; they are the kind of maps drawn by Ottoman Turkish navigator Piri Reis. The techniques that produced them are scarcely mentioned in the learned tradition. So alongside the written tradition there was another: an oral tradition that reached back to the Greeks and perhaps even beyond to older Mediterranean civilizations.

The written and the oral traditions interpenetrated. "Learned" information, such as Ptolemy's statement that no one knew what lay beyond the Pillars of Hercules, was transformed by popular tradition into giant bronze statues, warning voyagers to turn back. Conversely, popular traditions such as this, and the many stories that circulated about islands in the Atlantic, found their way into "learned" works, such as al-Idrisi's geography.

Both of these traditions contributed to Columbus's discovery of the New World, but of the two, the popu-

lar, oral tradition was probably the more significant, for Columbus was a medieval man and his mind was filled with marvels. It was only after his return from his first voyage that he began to search in scholarly works for justifications for the theories he held.

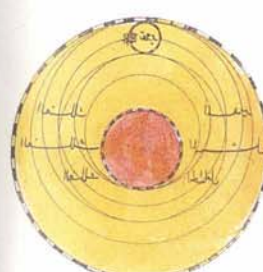
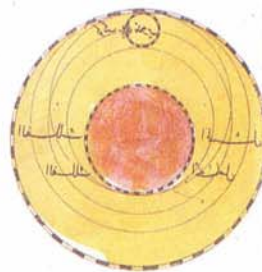
The primacy of oral over learned tradition in the Columbian adventure is shown in another facet of the admiral's protean character. There is no doubting Columbus's seamanship; years ago biographer Samuel Eliot Morison took note of his skill at dead-reckoning and his uncanny ability to find his way in uncharted waters. These were the sort of skills that made the portulans. But Columbus was hopeless with the compass and the astrolabe – with the latter, making errors sometimes in excess of 20 degrees. So compass and astrolabe may have reached Andalusia via the Arabs, but they were of little help in finding America.

The same might be said of the caravel. It used to be widely believed that Columbus's journey was made possible through innovations in ship-building: the development of the round-bottomed ship, the borrowing of the lateen rig from the Arabs, and so on. These certainly made the voyage easier, but they did not make it inevitable. The Phoenicians undertook long voyages in galleys; the Vikings in longboats; the Arabs in dhows; Cheng Ho of China in his huge, flat-bottomed junks; the Polynesians in outrigger canoes. Much more important than the kind of craft is having a destination, and Columbus knew exactly where he was going: He was sailing directly for Japan.

It is easy, blinded by his amazing discovery, to lose sight of Columbus's original purpose: He wanted to find a sea-route to the Spice Islands and China in order to trade for valuable spices directly with the suppliers, eliminating the middle men, who for centuries had been Muslim merchants. And if there is a single event that focused the minds of 15th-century Europeans on the desirability of doing this, it is probably the rise of Tamerlane.

Tamerlane and his hordes of Central Asian warriors laid waste great stretches of the Middle East. The old overland routes to China were interrupted; cities like Damascus and Aleppo and Cairo, merchant cities that trans-shipped spices and other goods to Europe, were either devastated or threatened with devastation. In 1401, the Spanish crown sent an embassy to Tamerlane in Samarkand, presumably to learn his intentions. Two years later, the Chinese emperor, also alarmed, sent an embassy to Malacca, an important emporium in the spice trade, for the same purpose.

Between 1405 and 1433, the emperor of China sent seven expeditions of huge junks, under the command of a Muslim admiral named Cheng Ho, into the Indian Ocean, to make contact with the rulers of the Spice Islands and to map them. Cheng Ho visited most of the Indian Ocean ports, including those on the Arabian Peninsula, and produced a fine map, on the Chinese grid-pattern, of the Indian Ocean. Later in the century Prince Henry the Navigator and his brother began to sponsor the Portuguese voyages



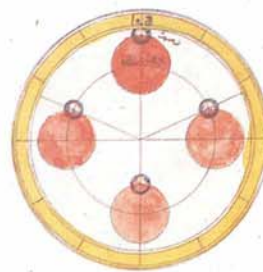
down the coast of Africa. Both the Portuguese and the Chinese were reacting to the same events: the effects of Tamerlane on long-distance trade.

The threat from Tamerlane soon receded; his descendants embraced Islam and became noted for their interest in architecture and science. But the idea of sailing directly to the East had taken root in the Iberian Peninsula, where close contact with the Islamic geographical tradition, both popular and learned, perhaps made such an idea appear more feasible than it would have elsewhere in Europe.

The major Islamic power during the European Age of Discovery, the Ottoman Empire, was little concerned with events on the far side of the Atlantic. But as the 16th century wore on, the lives of people living in Islamic lands were changed by these events, first in



Above, tiles from the Alcázares Reales in Seville show the castle and the lion that represent the two Spanish provinces of Castile and León; the third tile shows pillars – representing the Pillars of Hercules – and the magnificent motto *Plus Ultra*.



small and then in more important ways. Exotic fruits and plants made their appearance – the pineapple, the custard apple – and even a new bird, the turkey. More important was the introduction of maize, first mentioned in the *Ta'rikh-i Hind-i Gharbi*, where it is called "Egyptian millet," and the American root (or root-like) crops – manioc, sweet potatoes, potatoes and peanuts. These transformed lives and economies.

By the end of the 17th century, a Muslim reader who knew Turkish, Arabic or Persian could read of Columbus's discoveries and the conquests of Pizarro and Cortés, the discoveries of Balboa and Magellan, the exotic customs of the courts of Moctezuma and Atahualpa, in the *Ta'rikh-i Hind-i Gharbi*. The number of surviving manuscripts of this little book, and the marginal annotations by readers, carefully collected by Goodrich, show that there was a popular interest in the New World in Islamic lands.

Tobacco reached Fez in 1599, brought there by

Andalusian mercenaries from the south. Soon afterward, it appeared in the East. Its spread gave rise to polemics, and Hajji Khalifah, author of the first comprehensive modern geography in Turkish, the *Jihān Numa*, wrote against its use. It nevertheless became thoroughly acclimatized in Ottoman lands and was of great economic importance.

The flood of American silver into the Ottoman Empire – indeed, into all the economies of the world – had far-reaching consequences. For generations the "piece of eight" was the standard currency of trade from Morocco to China, and even Arab traveler Elias ibn Hanna, writing at the close of the 17th century, never left the domain of this silver coin, although he traveled from Baghdad to Peru. The former hegemony of the Spanish coin is evoked every time we write the dollar sign \$ – the two vertical strokes of which represent the Pillars of Hercules.

The transfer to the Americas of agricultural technologies and techniques that had originally been developed in Islamic lands – production of cotton, silk, sugar, indigo and cochineal – meant that some of these industries gradually declined or even disappeared in their original homelands. The prevalence of the prickly pear throughout Mediterranean lands today may be a relic of an effort to compete with cheap American cochineal.

It is fitting that this issue should close with the travels of an Arab of Nestorian descent, Elias ibn Hanna, and that he should have been the first Arab to travel widely in South America and write about his experiences. The Nestorians were the first interpreters to the Muslim scholars in Baghdad of Greek learning almost a thousand years before. In the 17th century, when Elias wrote, other members of the Oriental Christian communities, principally Maronites and Chaldeans, were once again acting as the interface between two cultures, this time between Christendom and Islam. These people were instrumental in the first European attempts to scientifically study the Arabic language.

The Catholic monarchs who sponsored Columbus, Ferdinand and Isabella, lived in Seville in an Arab palace, the Alcázares Reales. At the end of the 15th century, Seville, from which the exploration of the New World was orchestrated and from which Magellan set out on his circumnavigation of the earth, was dominated by the minaret of what had formerly been the Great Mosque. Charles V and other Spanish monarchs continued to dwell in the Alcázares Reales. Throughout the palace complex, decorative tiles made according to the old Islamic technique bear, below a representation of the Pillars of Hercules, the legend *Plus Ultra*, "There is More Beyond."

The removal of the negative, the two little letters *ne*, from the ancient motto *Ne Plus Ultra* was one of the great achievements of the human spirit. It was possible only through the efforts of people of different cultures and religions to remember and recover their common legacy. ☉



Pillars of Hercules II Sea of Darkness

As the Age of Discovery dawned, what did Columbus know about the shape of the world, and how did he know it?

The Strait of Gibraltar, gateway to the Atlantic, at left, as seen from the *Challenger* space shuttle in 1984. At right, a wall painting from the Escorial monastery-palace in Madrid, dating to 1585 and depicting a Spanish expedition against the Portuguese-held Azores.

Where the Mediterranean and the Ocean meet are found the lighthouses of stone and bronze built by Hercules, the great king. They are covered with inscriptions and surmounted by statues, which point as if to say: There is no way beyond me; beyond me there is no passage for those who enter the ocean from the Mediterranean! No ship can enter the ocean. It contains no inhabited land and no rational animals dwell there. Where it begins and where it ends are both unknown. It is the Sea of Shadows, the Green Sea, the Circumambient Ocean.

For the Latin Middle Ages, the Atlantic was *Mare Tenebrosum*; for the Arabs, *Bahr al-Zulamat*. Both meant "The Sea of Darkness," and anyone who has looked west from the northern coast of Portugal and seen the heavy cloud banks lying across the horizon will admit the name is well-suited to the Atlantic. It was ill-omened: For Christians, the word *tenebrosum* suggested evil and evoked the Prince of Darkness. For Muslims, the Arabic word for "darkness," *al-zulamat*, could not but call to mind the magnificent Qur'anic passage in Surah 24, al-Nur, "The Light," in which the state of the unbeliever is described as being like "the depths of darkness in a vast deep ocean, overwhelmed with billows, topped by billows, topped by [dark] clouds – depths of darkness, one above the other."

This name – and its analogue, "The Dark Sea," *al-Bahr al-Muzlim* – sufficiently indicates medieval man's fear and ignorance of the Atlantic Ocean. But the ocean had other, more propitious names as well. Two of these, "The Green Sea" and "The Circumambient Ocean," appear in the passage just quoted from the famous 10th-century Arab historian and geographer al-Mas'udi, whose works are full of fascinating geographical information. The Arabs used other names also, such as the scholarly *Uqiyanus*, directly transliterated from the Greek word *okeanos*, and even, in later sources from the western Islamic world, *al-Bahr al-Atlasi*, "The Sea of the Atlas Mountains" – an exact rendering of the word "Atlantic."

But the most frequent Arabic name for the Atlantic was *al-Bahr al-Muhit*, the Circumambient, or All-Encompassing, Ocean. This name embodied a very ancient notion. The Babylonians, and perhaps the Sumerians before them, envisaged the inhabited portion of the world as an upturned boat, a *gufa*, floating in the sea. This old Sumerian word was used to describe the round-bottomed reed boats used in the marshes of southern Iraq, where they are still known by the same name. Name and concept have proved extraordinarily persistent. The idea passed from Babylonia to the Greeks, and geographers from Herodotus and Hecataeus on described the world as surrounded on all sides by a universal ocean, even when the limits of the known world had been expanded far beyond anything the Babylonians could have imagined.

Long after Aristotle had demonstrated, in the fourth century BC, that the world was a sphere, the old Babylonian image persisted. Writing almost 1400 years after Aristotle, and perfectly aware that the earth is spherical, al-Mas'udi could still compare it to an egg floating in water. The Arab historian Ibn Khaldun, writing 400 years after al-Mas'udi and almost 1900 after Aristotle, compared the inhabited portion of the world to a grape floating in a saucer of water.

The Babylonians had little knowledge of lands beyond Mesopotamia and its immediate surroundings. Their image of the world was rooted in their cosmology, rather than based on observation. That the



Babylonians proved to be correct, in the sense that all the great bodies of water that encircle the globe are interconnected, is fortuitous. Yet it was this idea, passed on to the Greeks, then through the Arabs to medieval Europe, that contributed to the geographical discoveries of the 15th and 16th centuries.

Hernando Columbus, in his biography of his father Christopher, lists the classical and medieval sources that led the admiral to think he could reach the Indies by sailing westward. One of the most important of these sources was Aristotle's *De Caelo* (*On the Heavens*), a book known in Arabic translation since the ninth century and often quoted by al-Mas'udi. The original Greek text reached Italy in the 15th century, after the fall of Constantinople in 1453, but was not printed until after the discovery of America. It had been known in Spain, however, since the 12th century

through a commentary on it by Ibn Rushd of Cordova, the Averroes of the Latin Middle Ages. Whether Columbus knew *De Caelo* through Latin translations of Averroes or more directly through the new Renaissance translations by Italian humanists with whom he was in contact, is unknown. In any case, here is the passage that fired his imagination:

There is much change, I mean in the stars which are overhead, and the stars seen are different, as one moves northward or southward. Indeed there are some stars seen in Egypt and in the neighborhood of Cyprus which are not seen in the northerly regions; and stars which, in the north, are never beyond the range of observation, in those regions rise and set. All of which goes to show not only that the earth is circular in shape, but also that it is a sphere of no great size; for otherwise the effect of so slight a change of place would not be so quickly apparent. Hence one should not be too sure of the incredibility of the view of those who conceive that there is continuity between the parts about the Pillars of Hercules and the parts about India, and that in this way the ocean is one. As further evidence in favor of this they quote the case of elephants, a species occurring in each of these extreme regions, suggesting that the common characteristic of these extremes is explained by their continuity. Also those mathematicians who try to calculate the size of the earth's circumference arrive at the figure 400,000 stades. This indicates not only that the earth's mass is spherical, but also that as compared with the stars it is not of great size.

Leaving aside Aristotle's estimate of the earth's circumference, which is about twice too large, it is easy to see why Columbus seized upon this passage. Aristotle, the supreme authority for the Middle Ages, suggests that Asia may stretch right around the globe, perhaps joining Africa, or at least that both are washed by the same sea. Hence one could easily reach Asia by setting off westward, across the all-encompassing sea.

This, at least, was the theory. It was buttressed by many more classical references, as well as by medieval legends of islands to the west and even by odd sightings of worked wood cast up on the beaches of the Atlantic islands. But still to be overcome was a tremendous psychological barrier, the ancient belief that nothing lay beyond the Pillars of Hercules. This belief was enshrined in the motto *ne plus ultra*, "there is nothing beyond," a phrase echoed in al-Mas'udi's account of the statues "which point as if to say: 'There is no way beyond me....'"

For the classical world, the *Columnae Herculis*, the Pillars of Hercules, were not actual pillars – or lighthouses – but two mountainous points on either side of the Strait of Gibraltar, Calpe and Abyla: the Rock of Gibraltar and the mountainous point of al-Mina, where the city of Ceuta now stands on the ruins of Phoenician Abyla.

The Phoenicians sailed through the Pillars of Hercules around 1100 BC and founded their first Atlantic port, Gadir ("Fortified Place") where the city of Cádiz now stands. Somewhere in the hinterland lay the fabulous region – or perhaps city – known to the classical world as Tartessos and in the Bible as Tarshish. The Phoenicians established a rich trade with the eastern Mediterranean world in gold and silver from the rich mines of Tartessos. They also opened an Atlantic sea-route to the Cassiterides, the "Tin Islands," probably somewhere in Britain, and to the Baltic, where they traded for amber. Tin was a vital component in the making of bronze; amber was used for ornament. The Phoenicians had a virtual monopoly of both, and they jealously guarded it, sinking any rival ships that ventured into the western Mediterranean. They regarded their trade routes as state secrets, and classical sources cite at least one Phoenician trading vessel that ran aground rather than let a rival learn its course.

The Phoenicians and their successors, the Carthaginians, established trading colonies along the coast of north and west Africa. Anticipating Portugal's Prince Henry the Navigator by some 2000 years, they also made a number of efforts to circumnavigate Africa. One of these, sponsored by the Egyptian Pharaoh Necho II, took place about 600 BC. Herodotus, who calls Africa "Libya" and the Red Sea "the Arabian Gulf," is our only source of information about this voyage. Here is how he describes it.

As for Libya, we know that it is washed on all sides by the sea except where it joins Asia, as was first demonstrated, so far as our knowledge goes, by the Egyptian king Neco, who, after calling off the construction of the canal between the Nile and the Arabian Gulf, sent out a fleet manned by a Phoenician crew with orders to sail west-about and return to Egypt and the Mediterranean by way of the Straits of Gibraltar. The Phoenicians sailed from the Arabian Gulf into the southern ocean, and every autumn put in at some convenient spot on the Libyan coast, sowed a patch of ground, and waited for next year's harvest. Then, having got their grain, they put to sea again, and after two full years rounded the Pillars of

Hercules in the course of the third, and returned to Egypt. These men made a statement – which I do not myself believe, though others may – to the effect that as they sailed on a westerly course round the southern end of Libya, they had the sun on their right – to northward of them. This is how Libya was first discovered to be surrounded by sea....

There is no reason to doubt that this voyage took place. What Herodotus, and the Greek geographers that succeeded him, found difficult to accept was the sheer size of Africa. The consensus of opinion, made orthodox by Ptolemy, was that Africa extended little beyond 17° south latitude. Herodotus appears to have believed the same, hence his disbelief of the assertion that the sun was on the Phoenician voyagers' right.

Most pre-Ptolemaic Greek geographers did accept that Africa was bounded on all sides by the sea, except where it joined Asia. Ptolemy, however, supposed that not far below the Horn of Africa, the continent trended to the east, eventually joining the Chinese mainland and making of the Indian Ocean a landlocked sea. He may have been influenced in this by the passage from *De Caelo*, where Aristotle suggests that the presence of elephants in both Asia and Africa might indicate that the two continents were contiguous. Ptolemy compounded his error by postulating the existence of a huge "Southern Continent," a *Terra Australis*, to the south of Africa. This imaginary continent did not finally disappear from European maps until the early 18th century.

The Phoenician circumnavigators of Africa were practical seamen unhampered by theory. The Carthaginians, as the Phoenician colonists in the western Mediterranean came to be known, must have been aware of their compatriots' clockwise circumnavigation of Africa. Sometime before 480 BC, the Carthaginians sent a large expedition of their own, under a leader called Hanno, in the opposite direction. A Greek version of the original Punic account of this voyage makes it clear that Hanno reached a long way south, past the volcanic mountain he called "The Chariot of the Gods" – probably the 998-meter-high (3273-foot) Mt. Kakoulima in present-day Guinea – and as far as Sierra Leone. On the way he discovered both the Canary and Cape Verde Islands, so important later as staging points for trans-Atlantic voyages. The Cape Verde Islands were not rediscovered until 1456, nearly two thousand years later.

The Canaries are a classic example of how ancient

discoveries were made and then lost. Discovered by Hanno in the fifth century BC, they were explored and colonized in 25 BC by Juba II, erudite king of Mauretania and husband of Cleopatra Selene, daughter of Antony and Cleopatra. A passionate art collector, Juba was also interested in science and technology, inventing a new method of making purple dye from the orchil plant – and the export of orchil from the Atlantic islands was of economic importance until early this century. Juba populated the Canaries with Berber-speaking colonists, perhaps the ancestors of the Guanches. Gradually, knowledge of the location of the Canaries was lost, even though Lanzarote, the island nearest the North African coast, lies less than 100 kilometers (60 miles) west of the mainland. The Greeks called the Canary Islands *Tōn Makarōn Nēsoi*, "The Islands of the Blessed," and they were regarded as the furthest known land to the west. Ptolemy drew his 0° longitude line, or prime meridian, through the Canaries; the French continued to do so until the 19th century.

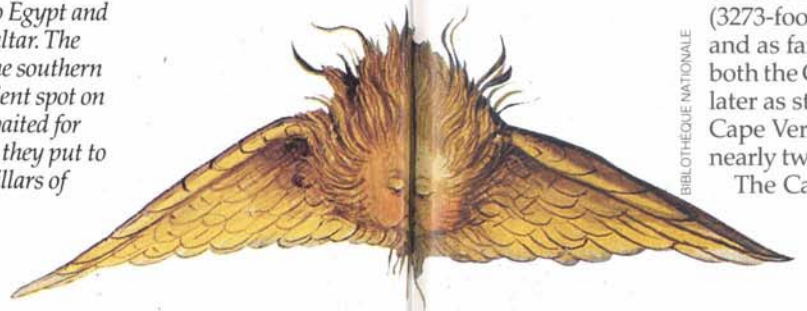
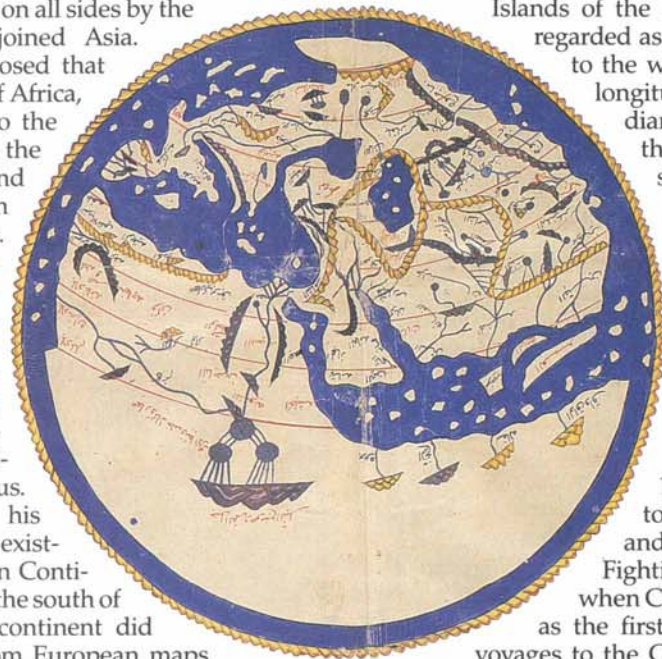
The Canary Islands were rediscovered in the 13th century by a French or Genoese ship blown off course. In 1402 the Normans partially conquered them, meeting stiff resistance from the indigenous Guanches. In the mid-15th century, the Spanish took control of the Canaries and continued the conquest. Fighting was still going on when Columbus used the islands as the first stop on all four of his voyages to the Caribbean. The Guanches were not finally subdued until the end of the 16th century, when they and their language virtually disappeared. From the few words of Guanche preserved in the Spanish chronicles, we know they spoke a form of Berber, and were therefore probably descended from Juba's colonists. Yet when Europeans encountered them, they had no memory of the mainland; having no boats, they were unaware that the other islands in the group were inhabited.

The Arabs knew these islands through Ptolemy, and called them *Jaza'ir al-Khalidat*, "The Eternal Isles," presumably a version of the Greek name. Some sources speak of these islands as if they were legendary, telling us for example that on each of the six islands – there are in fact seven – there was a bronze statue, like the one in Cádiz, warning voyagers to turn back. But al-Idrisi, the famous 12th-century geographer, who wrote at the court of King Roger of Sicily (See *Aramco World*, July-August 1977), tells of an attempted expedition to the Canaries in the late 12th



A map by Macrobius, at left, drawn between AD 395 and 435 shows how little was known of the world in the later Roman Empire. An imaginary continent is placed south of Africa with torrid ("burned"), temperate and frigid climate zones.

A world map by Arab geographer al-Idrisi, at right, commissioned by Norman king Roger II of Sicily and completed in 1154. The map, oriented with south at the top, is shown here inverted to aid in recognizing features. Below and on subsequent pages: Personifications of prevailing winds and other decorations from a world map by Ptolemy.



The rediscovery during the Middle Ages of the Canary Islands – the “Islands of the Blessed” of the classical geographers, the “Eternal Isles” of the Arabs – not only represented, to Arabs and Europeans alike, the confirmation of the truth of a classical text, but also served as a spur to search for other islands said to lie to the west.

The Arabs were the first to sight the Canaries, driven there by chance; they may have landed on one of the islands as early as the 10th century. The Vivaldi brothers, out of Genoa, may have landed in the Canaries during their voyage south in 1291. A French ship, caught in a gale, was driven onto one of the Canaries in 1334, although a Portuguese expedition of about the same date failed to find them. Their existence was well-enough known by this time for a man named Juan de la Cerda, a grandson of the Spanish monarch Alfonso the Wise, to have himself crowned King of the Canaries, although he was never able to raise the financial backing to make his pretentious title a reality.

There were other voyages to the Canaries which have left no traces in the European sources. One of these, which must have taken place about 1350, is described by Ibn Khaldun, the most original of late Islamic thinkers, in *al-Muqaddimah*, the introductory volume to his comprehensive history. This passage is also important because it contains one of the few descriptions in a literary source of the portulan charts, as well as a clear explanation of the difficulties of Atlantic navigation.

“We have heard,” says Ibn Khaldun, “that Frankish ships reached the Eternal Isles in the middle of this century. They attacked and plundered the natives, capturing some whom they sold on the coast of Morocco. These captives entered the service of the Sultan, and after learning Arabic were able to tell about life on their island. They said that they tilled the earth with horn tools, for they had no iron in their country. They ate barley bread and raised goats. They fought with stones, which they flung over their shoulders. They bowed down before the rising sun and had no scriptural religion. Muslim missionaries had not reached them.”

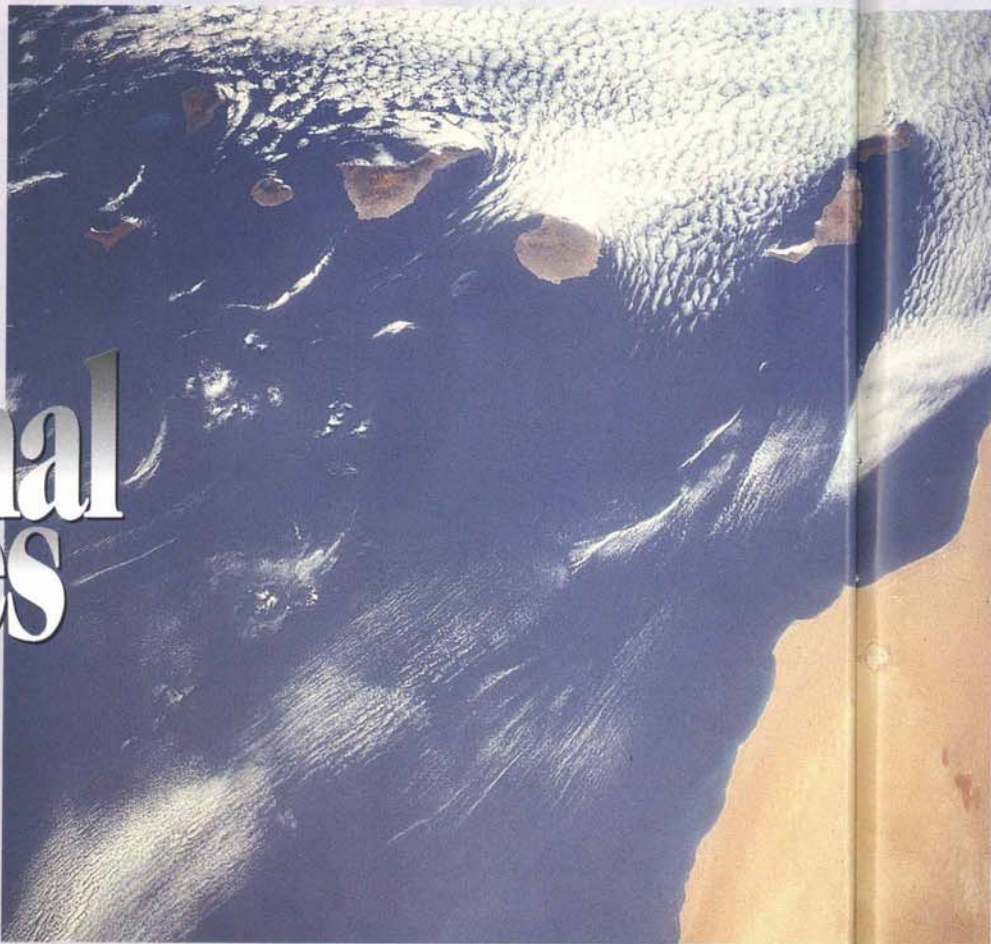
All these details are confirmed by later European sources, including the peculiar method of hurling stones, which the Guanche did with extreme accuracy. It is unfortunate that Ibn Khaldun says nothing about their original language, for this is a subject that has been much discussed. Ibn Khaldun continues with an important passage on the practice of late medieval sailors; everything he says applies equally well to the Mediterranean sailors of antiquity:

“The place where these islands lie cannot be found by intention, but only by chance, because ships sail on the sea where the winds take them, and navigation is dependent upon knowing the direction the wind blows, and where it blows from. A direct course is laid between two places that lie in the path of a particular wind. When the wind shifts to another quarter and the direction it is blowing is known, the

sails are adjusted and the ship sails according to the practices of sailors accustomed to sea voyages.

“The lands on the two shores of the Mediterranean are marked on a chart; their true positions on the coast are marked in order. The directions of the different winds are also noted. This chart is called the *kanbas* [compass]. Sailors depend upon these charts on their voyages.

“But no charts exist for the All-Encompassing Sea [the Atlantic]; that is why ships do not sail it, for if they were to lose sight of the coast, they would be hard put to return to it. The surface of this sea is also covered with mist, which prevents



ships from making their way.... Therefore it is difficult to lay a course for the Eternal Isles and find out more about them.”

This is an excellent description of the coast-hugging technique of the Mediterranean sailor. The use of *kanbas* to indicate a mariner's chart, rather than the pair of dividers used to measure distance, or the magnetic compass, is interesting, and may throw light on the obscure origins of this word.

Shortly after Ibn Khaldun wrote this passage, and largely as a result of the discovery of the Canary Islands, Portuguese and Spanish sailors discovered how to use the current and wind patterns of the Atlantic to reach destinations across open seas. The technique was called the *volta da mar*, or the “sea turn,” and went against reason, for it meant sailing well to the northwest of the Canaries in order to pick up the easter-

lies and return home. This was the discovery that made Atlantic navigation, far out of sight of land, possible. The Ottoman naval officer Piri Reis, a practical sailor himself, was quick to realize the significance of the discovery, and in his *Kitab-i Bahriye* gives good descriptions of the wind systems of the north and south Atlantic.

The rediscovery of the Canary Islands not only unlocked the secret of Atlantic navigation, thus opening the way to the New World, but set the pattern for conquest, settlement and economic exploitation of the Caribbean Islands. The Guanches, the indigenous inhabitants of the Canaries, were the first “primitive” people encountered by Europeans in modern times. Armed with the most rudimentary weapons, they heroically resisted their conquerors for more than a century and a half. In the end they succumbed, annihilated by superior weapons and unfamiliar diseases. Many were enslaved; the rest were assimilated into the new dominant population. The same sad story was to be repeated in the New World.

Columbus knew the Canaries well and was familiar with the Guanches. When he first encountered the inhabitants of the New World, it was to the Guanches that he compared them, noting the many physical similarities. And here he may have unconsciously touched upon a mystery to which the Canary Islands may once have held the key.

One of the few relics of the Guanches' material culture is a characteristic clay or wood seal, with a wide variety of designs, which was used to stamp colored patterns on the skin. These seals, called *pintaderas* in Spanish, are by no means unique to the Canaries. They are found in North and West Africa, the Balkans – where the earliest examples, dating from the fifth millennium BC, have been found – and even Japan. But they have also been found in archeological sites in the Caribbean and Central America, and many of these American examples have patterns very similar to those from the Canaries. The earliest examples from the Canaries have been dated to the second millennium BC; there is some evidence that they were still in use there at the time of the Spanish conquest. Their presence means the Canaries were inhabited from a remote period – before the time of the Mauretanian king Juba II, who colonized the islands in about 25 BC – and they may even, because of their similarity to American seals, indicate very ancient trans-Atlantic contacts.

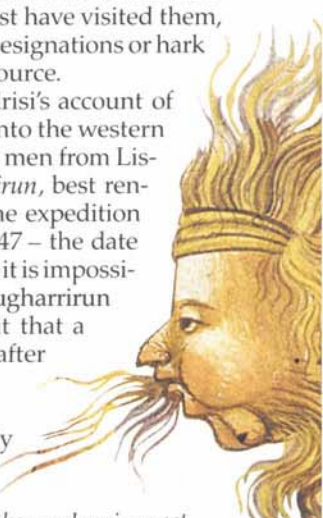
The Roman scholar Pliny the Elder reported that the Canary Islands were named for the species of large dog found there in classical times – *canis* being the Latin word for dog – but this smacks of folk etymology. Unfortunately, so do all the other origins that have been proposed for the name, most recently that the name derives from *qannariya*, the Andalusian Arabic word for the vegetable called cardoon, which is said to have grown there in profusion. It is more likely that the name is related to that of the people who may then have inhabited the opposite coast and now inhabit northeastern Nigeria, and who were known to al-Idrisi as the *qamanuriya*; they are now called the Kanuri. Those names are close to “Canaria” in sound, and is more likely that an island should be named after a people than after dogs or vegetables. In addition, the *qamanuriya* spoke Berber, al-Idrisi says; so did the Guanche. Perhaps the Kanuri were the original discoverers and colonizers of the Eternal Isles, the first stepping stone toward the New World.

century, during the reign of the Almoravid amir Yusuf ibn Tashufin. The admiral in charge of the expedition died just as it was about to set out, so the venture came to nothing. Al-Idrisi says the admiral's curiosity was aroused by smoke rising from the sea in the west, probably the result of volcanic activity.

After telling us that the Canaries had been visited by Alexander the Great and that the tomb of a pre-Islamic South Arabian king, made of marble and colored glass, can be seen on one of them, al-Idrisi gives the names of two of the islands. The island with a “circular mountain” in the center is called *Masfahan*. This is probably Tenerife, and the round mountain would be the 3600-meter-high (12,000-foot) volcano called Pico de Teide. The other island is called *Laghus* and is probably Gran Canaria. Neither name is Arabic, nor do they appear to be transcriptions of Greek, Latin or Romance – but the fact that these two islands had names at all means mariners must have visited them, and the names are either native designations or hark back to some lost, perhaps oral, source.

Even more interesting is al-Idrisi's account of an actual voyage of exploration into the western Atlantic, undertaken by 80 brave men from Lisbon whom he calls the *mugharrirun*, best rendered as “intrepid explorers.” The expedition must have taken place before 1147 – the date Lisbon fell to the Christians – but it is impossible to be more precise. The *mugharrirun* were so famous for their exploit that a street in Lisbon was named after them. The story is worth giving in full, for its mixture of fact and legend is characteristic of early accounts of Atlantic voyaging:

“It was from the city of Lisbon that the *mugharrirun* set out to sail the Sea of Darkness in order to discover what was in it and where it ended, as we have mentioned before. A street in Lisbon, near the hot springs, is still known as “The Street of the Intrepid Explorers”; it is named after them. Eighty men, all ordinary people, got together and built a large ship and stocked it with enough food and water for several months. Then they set sail with the first gentle easterly and sailed for about eleven days, until they came to a sea with heavy waves, evil-smelling, ridden with reefs and with very little light. They were sure they were about to perish, so they changed course to the south and sailed for twelve days, until they came to Sheep Island. There were so many sheep it was impossible to count them, and they ranged freely, with no one to watch them. They landed and found a spring of flowing water and a wild fig tree beside it. They caught some of the sheep and slaughtered them, but the flesh was so bitter they could not eat it. They took some sheepskins and sailed on to the south for another twelve days until they sighted an island. They could see it was inhabited and under cultivation. They headed toward it in order to explore and when they were not far offshore, they suddenly found themselves surrounded by boats, which forced their ship to land beside a city on the shore. They saw the men who



lived there; they were light-complexioned, with very little facial hair. The hair on their heads was lank. They were tall, and their womenfolk were very beautiful. They were confined to a house for three days. On the fourth day a man who spoke Arabic entered and asked them who they were and where they were going and what was the name of their country. They told him everything and he said not to worry, and that he was the king's interpreter. The next day they were taken into the king's presence and he asked the same questions they had been asked by the interpreter. They told him what they had told the interpreter the day before, of how they had embarked upon the ocean in order to find out about it and see the wonders it contained, and how they had come to this place. When the king heard this, he laughed and told the interpreter to tell them the following: "My father ordered some of his slaves to sail this sea and they sailed across it for a month until there was no more light; they came back having found nothing of any use at all." Then the king ordered the interpreter to treat them well so they would have a good impression of the kingdom, and he did so. They were then taken back to their place of confinement until the west wind began to blow. A boat was prepared for them, their eyes were bound, and they were at sea for some time. They said: "We were at sea about three days and nights. Then we came to the mainland and they put us ashore. They tied us up and left us there. When dawn broke and the sun rose, we found we were in great pain because we had been so tightly bound. Then we heard noises and the sound of people and we all cried out. Some people approached and, seeing our difficulty, released us. They asked us what had happened and we told them the whole story. They were Berbers. One of them asked us: 'Do you know how far you are from your country?' 'No,' we answered. 'Two months journey!' he replied. Our leader said, 'Wa asafi!' ('Woe is me!') and to this day the place is known as Asfi."

Asfi, a port on the southern coast of Morocco, is now called Safi. It is hard to escape the impression that we owe the preservation of this account largely to the folk etymology in the last line. But it is also obvious that this is a report of an actual Atlantic voyage. The "sea with heavy waves, evil-smelling, ridden with reefs and with very little light" can probably be ignored, for the passage is influenced by the "land of darkness" thought to exist in the farthest West, and the reefs may echo a passage in Plato's *Timaeus* which speaks of the shallows in the Atlantic marking the site where Atlantis sank. But "Sheep Island" (**Jazirat al-Ghanam**) has the ring of truth. In another passage al-Idrisi gives more details of this island – incidentally showing that a longer account of the voyage of the mugharrirun must have existed. He says Sheep Island is large, shrouded in shadows, and filled with small sheep whose flesh is bitter and inedible. Nearby is another island, called **Raqa**, which is the home of a red bird the size of an eagle, which catches fish in its claws and never flies far from the island. A fruit like a large fig grows there; if eaten, it is the antidote to any known poison. A king of the Franks heard of this, al-Idrisi adds, and sent a ship to the island to bring him that

fruit and some of the birds, but the ship was lost and never returned.

Sheep Island and Raqa are most probably two of the islands in the Azores. The Azores are named after a kind of goshawk – in Portuguese, *açor* – prevalent there at the time of discovery. The sheep are a problem, for the Azores were uninhabited when settled in the 15th century, and even if we slightly stretch the meaning of the word *ghanam*, which can also mean "goats," we are still left with the problem of the origin of the creatures. No large mammals are indigenous to the Azores, and sheep or goats could only have been brought to the island by previous mariners. The Azores lie almost 1300 kilometers (about 800 miles) west of the coast of Portugal – one-third of the way to America. In the 19th century, Carthaginian coins were found on the most westerly of the islands, Corvo – 31° west longitude – and although the find has been questioned, the origin of the coins has never been satisfactorily explained. Corvo is marked on the Cantarino map of 1351, where the name occurs as Corvini – considerably before its official discovery.

Al-Idrisi mentions a number of other islands in the west Atlantic:

Sawa is "near the Sea of Darkness." Alexander the Great spent the night there just before entering the western darkness. The inhabitants threw stones at the travelers and hurt several of Alexander's companions.

The inhabitants of the island of **al-Su'ali** are shaped like women and their canine teeth protrude. Their eyes flash like lightning and their thighs are like logs. They fight against the monsters of the sea. Men and women are not sexually differentiated, and the men have no beards. They dress in the leaves of trees.

The island of **Hasran** is crowned by a large, high mountain. A small fresh-water river runs down from the foot of the mountain, where the inhabitants live. They are short, brown people with broad faces and big ears. The men's beards reach their ankles. They eat grass and other plants.

Al-Ghawr is long and broad. Many herbs and plants grow on the island. There are many rivers and pools, and thickets where donkeys and long-horned cattle take refuge.

Al-Mustashkin is said to be inhabited. It has mountains, rivers, fruit trees, cultivated fields and a town, with high walls. There used to be a dragon in the area, and the people were forced to feed it with bulls, donkeys or even humans, according to the legend; when Alexander arrived, the people complained to him of the dragon's depredations. Alexander fed the creature a volatile mixture and blew it to pieces.

The island of **Qalhan** is inhabited by animal-headed people who swim in the sea to catch their food.

Then there is the **Island of the Two Brothers**, Shirham and Shiram. God changed them to stone for practicing piracy, the legend has it. This island is near Asfi [Safi], and on a clear day smoke can be seen rising from it. It was this smoke that led to the abortive expedition by Yusuf ibn Tashufin's admiral.

The Atlantic Ocean, from the Catalan Atlas, ca. 1375.



Some of the names of these islands make sense in Arabic, others do not. Sawa has no meaning. Al-Su'ali is a word that refers to a kind of female demon or vampire; judging by al-Idrisi's description of the female inhabitants of the island, it is apt. Hasran means "regretful" – Island of Regret? – but if the variant *Khusran* is chosen, it means "loss" – perhaps Island of Loss, or Lost Island. But if the word is Arabic, one would expect it to be preceded by the definite article *al*.

Al-Ghawr makes sense; it means a depression surrounded by higher land, and occurs elsewhere in the Arab world as a place name. Al-Mustashkin is probably a corruption of *al-mushtakin*, meaning "the complainers" – appropriate enough for a population in thrall to a dragon. This story of Alexander and the dragon echoes the Eleventh Labor of Hercules, the Golden



Apples of the Hesperides, guarded by the dragon Ladon. In the Arabic-speaking world, popular legend transferred a number of the heroic deeds of Hercules to Alexander – including the building of a land-bridge across the Pillars of Hercules. Some Greek mythographers thought the Islands of the Hesperides lay off the coast of North Africa, and we have already seen how al-Idrisi associates Alexander with two of the Atlantic islands.

Qalhan's "animal-headed people" might well be seals. The Two Brothers could be the two small islands off Lanzarote in the Canaries, Alegranza and Graciosa, or indeed, any two prominent rocks off their coasts.

A last island in the western Atlantic is *Laqa*. Al-Idrisi says aloe trees grow there, but their wood has no scent. As soon as they are taken away, however, the scent becomes perceptible. The wood is deep black, and merchants come to the island to harvest it and

A marginal note in Columbus's own copy of Peter d'Ailly's *Imago Mundi*, now in the Columbina Library in Seville, reads: "Note: Sailing south from Lisbon to Guinea, I carefully noted the distance, as pilots and sailors do. Then I took the sun's elevation many times, using a quadrant and other instruments. I found myself in agreement with Alfraganus, that is to say, the length of a degree is $56\frac{2}{3}$ miles. Thus this measurement must be accepted. As a result, we are able to state that the earth's circumference at the equator is 20,400 miles...."

We know from another marginal note that an astronomer named Joseph, in the service of the king of Portugal, had calculated the latitude of Los Idolos Island, off the Guinea coast, as one degree five minutes north. The accepted latitude for Lisbon at the time was 40 degrees 15 minutes north.

Columbus considered Lisbon and Los Idolos Island to be on the same meridian, and estimated the distance between the two places by dead-reckoning, probably comparing his own estimate with estimates made by the Portuguese navigators. By a simple calculation, he obtained the figure of 56 miles to the degree – close enough to Alfraganus's figure of $56\frac{2}{3}$. To obtain the circumference of the earth at the equator, he simply multiplied $56\frac{2}{3}$ by 360.

Columbus measured distance at sea by the Italian nautical mile, and thus, when he writes that the circumference of the earth is 20,400 miles, he is referring to Italian nautical miles. One Italian nautical mile is equivalent to 1480 meters (4856 feet), and, converted into modern units, Columbus's measure of the circumference of the earth was thus 30,185 kilometers (18,756 miles), or about 25 percent less than the true value of 40,010 kilometers, or 24,861 miles.

His reading of Marco Polo and the Toscanelli letter and map had convinced Columbus that Asia extended much farther to the east than Ptolemy had thought and that, consequently, Cipangu lay about as far to the west of Spain as – in fact – the West Indies lie.

Columbus's argument for the feasibility of reaching the Spice Islands by sailing west hinged on this figure of $56\frac{2}{3}$ miles to the equatorial degree. Since he was seeking royal support for his venture, he needed an authority of more weight than either Marco Polo or Toscanelli to underpin this crucial number; while they might both be dismissed as rather dotty fantasists, it was not so easy to dismiss Alfraganus, who carried all the authority of the Arab astronomical and mathematical tradition behind him. Columbus's claim to have verified Alfraganus's calculations must be seen in this light.

"Alfraganus" is the Latin version of the Arabic name al-Farghani, and refers to Abu al-'Abbas Ahmad ibn Muhammad ibn Kathir al-Farghani. He was one of the scholars associated with the Caliph al-Ma'mun's great efforts to produce Arabic versions of Greek scientific texts in early ninth-century Baghdad. He may well have himself taken part in the scientific expedition which, sometime between 820 and 833, set out to measure the actual length of one degree of a meridian.

This was probably the first attempt since the time of Eratosthenes to measure the length of a degree. Although there are no surviving eyewitness accounts of the experiment, we know from later sources how it was done: Two locations were identified whose latitudes, determined astronomically, differed by one degree. A north-south baseline connecting them was carefully laid out by sighting along pegs, and the length of that baseline was measured. In the experiment in which al-Farghani took part, two pairs of locations were actually chosen, one pair in northern Iraq, on the plain of Sinjar, and the other near Kufah – both areas as flat and featureless as possible. The results were then compared, and the length of a degree established as $56\frac{2}{3}$ miles.

Al-Farghani subsequently wrote a very influential little book on astronomy, a number of copies of whose Arabic text survive. The title can be translated *Compendium of the Science of the Stars and Celestial Motions*. This was twice translated into Latin in Spain during the Middle Ages, once by Gerard of Cremona and once by John of Seville, working under the auspices of Alfonso the Wise. A Hebrew translation also survives. The *Compendium*, in its Latin version, was widely circulated in Europe and remained a standard authority almost to the time of Galileo; it was first printed in 1493, the same year Columbus returned from his first voyage.

It is worth quoting al-Farghani's exact words, for they were of supreme importance to Columbus: "In that way we find that the value of a degree on the celestial sphere, taken on the circumference of the earth, is $56\frac{2}{3}$ miles, each mile being equal to 4000 black cubits, as was ascertained during the time of al-Ma'mun – May God's grace be upon him! And on this point a large number of the learned are in agreement."

Yet the correct value for the length of a degree on the meridian is not $56\frac{2}{3}$ but roughly 69 statute miles, or 60 nautical miles (by definition), or 111 kilometers and a fraction. How could competent astronomers, skilled in mathematics, have made an error of such magnitude?

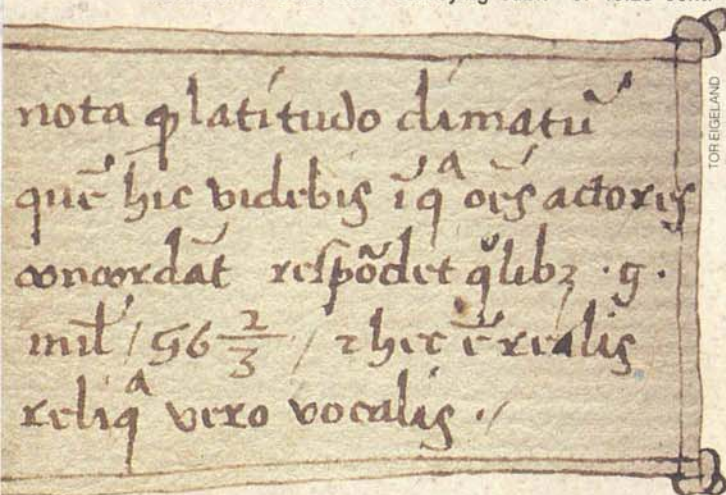
At right, Columbus's reference to al-Farghani and the length of a degree, written in the margin of the admiral's own copy of Pierre d'Ailly's *Imago Mundi*, now in the Biblioteca Colombina, Seville.

Al-Farghani and the Short Degree

At left, the 1457 Genoese planisphere, or world map, by Paolo Toscanelli, a Florentine physician and geographer whose theory of a large Asia and a narrow Atlantic Ocean had a great impact on Columbus.

The basic unit of measurement in the Arab world was the *dhira*, or cubit. Originally, this was the distance from the elbow to the tip of the middle finger, but a sophisticated culture could not tolerate the variation implicit in this ancient unit of measurement, so the length of a cubit was standardized. The earliest standard cubit is known as the "legal cubit", so called because it is the one used in the holy law of Islam, the *shar'iyah*. It is equivalent to 49.8 centimeters (19.6 inches). For surveying purposes, al-Ma'mun introduced another cubit, equivalent to 48.25 centimeters (19 inches). Finally, there is the "black cubit," the standard for which was indicated on the Nilometer on the island of Rawda, in the Nile River. This was equivalent to 54.04 centimeters (21.28 inches). Which cubit did al-Farghani use?

The obvious answer is that he used the "black cubit" of 54.04 centimeters, since he actually uses that term. But we know from other sources that the black cubit had not yet been introduced during the reign of al-Ma'mun, when the length of a degree was measured on the plain of Sinjar. So in spite of the terminology al-Farghani uses, his "black cubit" must in fact refer to either the "surveying cubit" of 48.25 centi-



meters, or to the legal cubit of 49.8 centimeters. The latter is the more likely, since we know that it was the most commonly used unit during al-Farghani's lifetime.

There are 4000 cubits in an Arab mile. If al-Farghani used the legal cubit as his unit of measurement, then an Arab mile was 1995 meters (6545 feet) long. A degree on the meridian would measure 113 kilometers (70.25 miles) – two kilometers greater than the true value, but well within acceptable limits of error. If he used al-Ma'mun's surveying cubit, then a degree contained 109 kilometers (67.73 miles) – two kilometers less than the true value, but an equally respectable result under the circumstances.

In other words, al-Farghani's so-called "short degree" of 56 2/3 miles was not short at all, but was very close to the true length of a degree of the meridian. The error was not al-Farghani's, but Columbus's. Unaware that an Arab mile was considerably longer than an Italian nautical mile, Columbus seized upon the figure of 56 2/3 miles for the length of the degree and used it to justify the theory which – in all probability – he already held.

then sell it to the kings of the farthest West. The island is said to have been inhabited in the past, but it fell to ruin and serpents infested the land. For this reason, no one can land there. Could Laqa be Madeira? Madeira was heavily wooded when first settled in the 15th century – hence its name. The settlers quickly burned down all the forests, so it is now hard to know for certain, but some sort of scented wood may have once grown there.

Al-Idrisi gives the names of 13 islands in the western Atlantic; a 14th, visited by the mugharrirun, is nameless. This unnamed island, together with Masfahan, Laghus, The Two Brothers and possibly Sawa, are almost certainly islands in the Canary group. Laqa might be Madeira, and Sheep Island and Raqa part of the Azores group. Where al-Su'ali, Hasran, al-Ghawr, Qalhan and al-Mustashkin lay is anybody's guess. Al-Su'ali and al-Mustashkin both sound completely legendary, but there is nothing legendary about Hasran and Qalhan, which sound as if they might belong together. Since the only inhabited islands in the western Atlantic just before the coming of the Europeans were the Canaries, Hasran may belong to that group – unless, of course, it is to be sought in the Caribbean!

Here is another tantalizing reference to early Atlantic voyages, this time from al-Mas'udi. The account must date from before AD 942, the date al-Mas'udi completed the book from which it is taken:

It is a generally accepted opinion that this sea – the Atlantic – is the source of all the other seas. They tell marvelous stories of it, which we have related in our work entitled The Historical Annals, where we speak of what was seen there by men who entered it at the risk of their lives and from which some have returned safe and sound. Thus, a man from Cordoba named Khashkhash got together a number of young men from the same city and they set sail on the ocean in ships they had fitted out. After a rather long absence, they returned with rich booty. This story is famous, and well-known to all Spaniards.

The *Historical Annals*, which presumably gave a much more detailed account of this and other voyages, is lost. That the story was preserved at all is probably due to the rarity of such voyages. On the other hand, this passage shows that Atlantic voyages were made, and remembered.

In what direction did Khashkhash sail? If he went north, he may well have plundered the coasts of Portugal, France or even England. But the story occurs in the context of a discussion of the All-Encompassing Sea, not the coasts of northern Europe, which were relatively well-known to the Arab geographers. The context implies that Khashkhash sailed west. If so, the nearest place that could offer rich booty was the Caribbean.

The voyages of the mugharrirun and Khashkhash were private undertakings, apparently motivated by curiosity and bravado. The mugharrirun were "ordinary people"; the companions of Khashkhash were

simply "young men of Cordoba." This is probably why we know so little about them. Medieval historians focused their attention on the ruler and his court, and to a certain extent on the "urban elite." The doings of private citizens, particularly of the humbler classes, are only incidentally mentioned by Arab historians of the Middle Ages – or indeed, by their Christian counterparts. We know as much as we do about the efforts of Prince Henry the Navigator to find the sea-route to the Indies because these expeditions were sponsored by the Crown, and the same is true of the four voyages

"In each degree are 56 2/3 miles," wrote Columbus in the margin of his copy of *Imago Mundi*, left, using a figure calculated by al-Farghani.

Columbus was unaware that an Arab mile was substantially longer than an Italian nautical mile.

Muslim astronomers at work with an armillary sphere, depicted in a 16th-century manuscript of the *Shah-Nama*, at the Istanbul University Library.



of Columbus. Documents, logs and maps were placed in royal archives and were available to the historians of the time, whereas knowledge of the mugharrirun and Khashkhash has come down to us only because of the chance interest of al-Idrisi and al-Mas'udi. It is probable, however, that they entered sailors' lore along the Atlantic seaboard and joined the tales of other fabulous islands to the west – the Antilles, Brazil, St. Brendan's Isle, the Green Isle.

These imaginary islands were marked on 14th-century charts, along with others. The Antilles and Brazil, for so long legendary, continue today as the names of real places. Men were still seeking St. Brendan's Isle as late as the 18th century; Ilha Verde, the

Green Isle, did not finally disappear from mariner's charts until the middle of the 19th century. Throughout the Middle Ages, stories of islands to the west kept interest in the far reaches of the Atlantic alive, and when real islands began to be discovered in the 14th century, the legends took on new life. After all, if the Islands of the Blessed really existed, why shouldn't the Antilles? In the 15th century, as the Azores, Madeira, the Canaries and the Cape Verde Islands were gradually colonized and brought under sugar cultivation, the search became more intense. Genoese bankers were willing to finance sugar production; the search for free land – unencumbered by tenants who enjoyed hereditary rights and paid fixed rents in inflationary times – was seen as an escape from economic depression.

And who knew what lay beyond the Canaries, or the Azores? After all, al-Idrisi, who repeatedly says that nothing lies beyond the Eternal Isles, splendidly contradicts himself by telling us in another passage, quoting no less an authority than Ptolemy himself: "There are 27,000 islands in this sea, some inhabited, others not; we have mentioned only those closest to the mainland, and which are inhabited. As for the others, there is no need to mention them here."

This is the background against which Columbus's voyages were made. He had taken part in the expeditions sent along the African coast by Prince Henry the Navigator. He knew the Atlantic islands well; his wife was the daughter of Bartolomeo Perestrelo, one of the early settlers on Madeira. Her sister was married to Pedro Correa, of the same island, who found a piece of worked wood cast up on the beach that he believed had drifted east from unknown western lands. Columbus's son Hernando, writing in 1537, shows very well the grip these islands had on his father's mind, after first describing his father's reading in ancient and medieval sources and Paolo Toscanelli's letter on the possibility of reaching Asia by sailing west:

The third and last thing that led the Admiral to discover the Indies was the hope he entertained, before reaching them, of finding some island or land of great utility, from which he could continue his main search. He was confirmed in this hope by reading the books of many wise men and philosophers who said, as a thing not admitting doubt, that the greater part of our globe is dry land, because the area covered by land is greater than that covered by water. This being so, he argued that between the coast of Spain and the borders of India then known, there would be many large islands, as experience has shown. He believed this the more readily because of certain fables and stories which he heard told by various people and mariners who traded in the islands and the seas west of the Azores and Madeira. These were stories which fitted in with his own opinions, and he remembered them. He never tired of telling them, to satisfy the curiosity of those who enjoy such curiosities.

Piri Reis and the Columbus Map

A famous Ottoman map provides clues to the sources used by Columbus himself, and how he saw his discoveries.

The texts on the Ottoman Turkish map at left, which was drawn by Piri Reis in 1513, describe Columbus's discovery of America. Above right, a rough chart of Hispaniola, sketched by Columbus himself, showing Navidad (here spelled "Nativida"), the island's first Spanish settlement. Below and on subsequent pages: lateen- and square-rigged ships are decorations from the Piri Reis map.

In 1501 an admiral in the Ottoman navy named Kemal Reis captured seven Spanish ships off the coast of Spain, near Valencia. Aboard one of the prizes he found a strange feather headdress and an unfamiliar black stone. He was told by one of his prisoners that both came from newly discovered lands to the west, beyond the Sea of Darkness. The prisoner claimed to have visited these lands three times, under the command of a man named Colombo – and what was more, he had in his possession a chart, drawn by this man Colombo himself, that showed the newly discovered lands.

This was probably not the first time Kemal Reis had heard of Christopher Columbus's discovery. He had been sailing the Mediterranean for years, originally as a corsair. In 1490 he had gone to the relief of Granada, then besieged by Ferdinand and Isabella, but had been able to do little to alleviate the city's plight. In 1500, he had won a major victory over the Venetians in the eastern Mediterranean, capturing the important strongholds of Lepanto, Coron and Modon. He had

appointed men like Kemal Reis, with wide experience of Mediterranean waters, as admirals. To European observers, it seemed only a matter of time before the Turks would be at the gates.

The preoccupation of European courts with the rise of the Ottoman Turks in the East partly explains their relative lack of interest in Columbus's discoveries in the West – especially since no one, including Columbus, was clear about what had been discovered. Bayazid, however, was very interested in maps and geography, probably largely for political and practical reasons: The enormous extent of the Ottoman empire meant good maps were vital for military purposes. We know that Bayazid possessed a magnificent Arabic copy of Ptolemy, still in the Topkapı Palace Library (See *Aramco World*, March-April 1987), a large-scale map of the Balkans, probably of European origin, and many other important charts and maps.

Columbus's discoveries in the Atlantic, however, were very remote from Ottoman interests. Closer to home were the Portuguese. Vasco da Gama found the

almost certainly heard of Columbus within months of Columbus's return from his first voyage, either from prisoners of war or from contacts in the Genoese and Venetian colonies in the eastern Mediterranean.

Between 1492 and 1501, while Columbus was making his first three voyages, the Ottoman sultan Bayazid II was occupied on all fronts. The Mamluks of Egypt were still a very real threat to the Ottomans on the borders of Anatolia. The *safawiya* movement, soon to give birth to the powerful Safavid dynasty in Iran, was gathering momentum among the Turkoman tribes on Bayazid's eastern frontiers, and even within Anatolia itself. In Europe, the Ottoman victory in the war with Venice had resulted in a powerful Ottoman presence in what is now Yugoslavia, at the borders of the Venetian republic. Important victories had also been won in Austria, and although the Ottomans were defeated in the very year Columbus discovered America, it was only a matter of time before more Austrian territory was lost to the Turks. Convinced of the need for a powerful modern navy, Bayazid opened shipyards at Gallipoli and in the Adriatic and

way around Africa into the Indian Ocean in 1497 and within a very short time the Portuguese virtually controlled the trade routes to the Spice Islands – routes which had been under Muslim control for centuries. These were the very islands Columbus thought he had reached by sailing west: The Portuguese succeeded in reaching them the other way round. As yet, the Ottomans were unable to respond, but the Mamluks in Egypt, through whose ports the lucrative spice trade had traditionally run, sent a fleet to the Indian Ocean under an admiral called Husayn after the Portuguese sank 17 Arab trading vessels in an Indian port. In 1508, Husayn won a naval encounter against the Portuguese, sinking the admiral's ship. The Portuguese countered in the following year, and the Mamluks fortified Jiddah, using it as a base for naval operations in the Red Sea and Indian Ocean. The situation changed dramatically when the Ottomans, under Bayazid's successor Selim the Grim, conquered Egypt in 1517 and put an end to Mamluk rule. The security of Muslim shipping off the Arabian coasts and in the Indian Ocean was now the Ottomans' responsibility.

ROLAND & SABRINA MICHALIO

This was the background against which the famous world map of Piri Reis was made. Piri Reis was the nephew of Kemal, and had sailed with his uncle since he was a boy. In his *Kitab-i Bahriye*, he touchingly commemorates his uncle, from whom he learned so much:

*Good friend, I want you
To remember us in your prayers,
And remember Kemal Reis, our master,
May his soul be content!
He had perfect knowledge of the seas
And knew the science of navigation.
He knew innumerable seas;
No one could stop him
We sailed the Mediterranean together
And saw all its great cities.
We went to Frankish lands
And defeated the infidel.
One day an order from
Sultan Bayazid arrived.
"Tell Kemal Reis to come to me,"*

*It said, "and advise me on affairs of the sea."
So in 1495, the year of this command,
We returned to our country.
By the sultan's command we set out
And won many victories....
Kemal Reis sailed hoping to come back,
But was lost at sea.
Everyone once spoke of him;
Now even his name is forgotten....
The angel of death caught him
While he was serving Sultan Bayazid.
May God give peace to those
Who remember Kemal Reis with a prayer.
Kemal died and went to the next world
And we found ourselves alone in this.*

Kemal Reis went to the next world in 1511, having apparently entrusted the precious chart captured in the Spanish ship to his nephew Piri. Piri Reis, from the time he was a boy, had kept notes of harbors entered, compass bearings, reefs, shallows and hidden rocks, and was by now an experienced cartographer: The more than 125 large-scale maps in the *Kitab-i Bahriye*, "The Book of the Navy," show just how skillful he was.

Piri Reis spent the next two years in Gallipoli drawing a world map. Though Bayazid died in 1512, it is probable that this project was supported by the sultan, or at least known in official circles. This can be deduced from the fact that Piri used 20 source maps; he may have collected some of these personally, either by capture or purchase, but it is probable that up-to-date Portuguese charts were supplied to him by the sultan's officials.

In one of the inscriptions on the map itself, Piri Reis lists these sources, and tells us how he used them:

No one now living has seen a map like this. I have composed and constructed it using about twenty maps and mappaemundi; these are the maps which were composed in the time of Alexander of the Two Horns, and which show the inhabited portion of the earth. The Arabs call these maps ja'fariya.

I have used eight ja'fariya maps, an Arab map of India and four recent Portuguese maps – these maps show the sea of Sind, India and China according to mathematical principles – and also a map of the western regions drawn by Colombo. The final form was arrived at by reducing all these maps to the same scale. Therefore the present map is as accurate for the Seven Seas as the maps of our own countries used by sailors.

Another note gives the date and authorship of the map: "This map was drawn by Piri ibn Hajji Muhammad, known as the nephew of Kemal Reis, in the month of Muharram of the year 919 [1513]."

The mappaemundi, or world maps, that Piri Reis says

were "composed in the time of Alexander of the Two Horns," as Alexander the Great was known in the Muslim world, were maps based on Ptolemy. (Arab authors confused Claudius Ptolemeus, astronomer and geographer, who lived in the second century, with

Ptolemy I, friend of Alexander and ruler of Egypt, who died in the third century BC.) It is obvious, however, from looking at Piri Reis's map that the mappaemundi he used as a source for the west Atlantic were European, as the depiction of St. Brendan's Island shows. Piri's caption to the charming picture of two men lighting a fire on the back of the fish reads: "They say that long ago a priest named San Vulrandan [St. Brendan] sailed the seven seas. It is said that he encountered this fish

and, taking it for dry land, lit a fire on its back. When the back of the fish grew hot, it dived under the water. The people fled in their boat back to their ship. The Portuguese do not mention these events; they have been taken from old mappaemundi."

This is not the first time the story of mariners mistaking giant fish for islands and lighting fires on their backs occurs in an oriental context. Al-Jahiz tells the same story in his *Book of Animals*, written in the ninth century (See *Aramco World*, May-June 1982); it occurs in the Arabic translation of the *Life of Alexander* as well as in *The Thousand and One Nights*. But it is fascinating to see a reference to St. Brendan in a Turkish context. It also shows something significant about at least one of Piri Reis's source maps. Pictures of legendary islands – or in this case, a picture of an episode from a legendary voyage – were not depicted on Ptolemaic mappaemundi, which were produced in learned circles; they did occur on mariner's charts made for practical use (See "Voyages of the Mind," in this issue). Piri Reis must have had at least one European mariner's chart, probably showing the coasts of Spain, North Africa and the Atlantic islands. It may have looked very like the map by Grazioso Benincasa, which is dated 1473 and shows two large imaginary islands, Antilia and Satanazes – although, unfortunately it does not include a giant fish.

A number of captions on the Piri Reis map seem to point to the Genoese origin of one or more of his source maps. The caption next to the Azores, for example, reads: "A Genoese ship out of Flanders was driven by a storm to these islands, and they thus became known." As far as we know, the Azores were first sighted around 1420 by a Portuguese, not a Genoese, ship. An earlier discovery by the Genoese is not unlikely, however, but knowledge of it may have been limited to Genoese circles.

The caption to the Cape Verde Islands seems to

reinforce the idea. It reads: "The Genoese call the captain of this caravel Messer Anton, but he grew up in Portugal. One day his caravel ran into a storm and was driven to these islands. He found much ginger and was the first to describe these islands." One of the Portuguese ships that discovered the Cape Verde Islands in 1456 was commanded by a Genoese in Portuguese service named Antoniotto Usodamare. The islands in the archipelago were not fully explored until 1460, when another Genoese, named Antonio da Noli, was appointed governor of the island of Sant 'Iago. Since Piri's captain speaks of a chance discovery, the "Messer Anton" of his source map was probably Antoniotto Usodamare, the first of these two Genoese Antonios associated with the islands. Again, this points to a Genoese origin for the chart Piri was copying: Local pride would explain why the Genoese captain, and not the more important Venetian, was mentioned as the discoverer.



This remarkably accurate map of Hispaniola, known as the Morales Map, dates from about 1516 and is one of the earliest known. Some experts attribute it to Peter Martyr, others to Columbus's brother Bartholomew.

The mention of ginger in the Cape Verde Islands is significant too. Ginger does not grow in these islands, but it is possible that the ginger substitute asarabacca did. It was widely believed in the 15th century that valuable spices grew anywhere along the equator; Columbus was constantly "discovering" old world spices in the West Indies where they did not in fact exist. The statement that ginger grew in the Cape Verde Islands sounds very "Columbian," and it is possible that this note may have originated with Columbus himself.

These associations with Genoa are particularly interesting in view of Columbus's own Genoese origin. When the Piri Reis map was discovered in the Topkapı Palace Museum in 1929 (See *Aramco World*, January-February 1980), it was naturally the long inscription referring to Columbus that excited the most interest. Paul Kahle, the first scholar to write

about the map, suggested that the Caribbean portion of it was based on a map drawn by Columbus himself, just as Piri Reis states. If so, this Turkish map is the only evidence we possess for how Columbus visualized his discoveries.

Here is what Piri Reis tells us in a long legend on the map itself:

These coasts are called the shores of Antilia. They were discovered in the year 896 of the Muslim era [AD 1490]. It is reported that a Genoese called Colombo was the first to discover these territories. It is said that a book came into his hands which stated that at the end of the Western Sea, on its western side, were coasts and islands and different kinds of metals and precious gems. This man, having studied the book thoroughly, explained these things one by one to the great men of Genoa and said: "Give me two ships and I will go and find these regions!" "O foolish man," they said, "in the West there is nothing to be found but the end and limit of the world! It is full of darkness." The said Colombo saw there was no help to be had from the Genoese so he went to the king of Spain and told him his story in detail. The king gave him the same answer as the Genoese. At last, after Colombo had been very insistent, the king gave him two ships, equipped them well, and said: "O Colombo, if what you say is true, I will make you admiral over that country." Having said this, he sent the said Colombo to the Western Sea.

The late victorious Kemal [Reis] had a Spanish slave. This slave said that he had been three times to that land with Colombo. He said: "First we sailed through the Strait of Gibraltar, then we voyaged straight ahead for 4000 miles, sailing a middle course between west and southwest in the Western Sea. Then we saw an island ahead of us and the waves became still and the sea became calm. The North Star ... gradually became veiled and finally invisible." He also said that the stars in that region are not disposed as they are here; they are in a different arrangement.

They anchored at the island they had sighted in front of them. The inhabitants of this island approached, shot arrows at them and did not allow them to land and get information. The men and women shot arrows, the tips of which were made of fishbone. The entire population goes naked. When they saw that they could not land on the island, they sailed to the other side, where they saw a boat. When it saw them, the boat fled and the people ran away onto the land. They took the boat and saw that it was full of human flesh. The people of that nation went from island to island hunting men and eating them.

The said Colombo saw another island; they drew near it and saw that it was covered with large snakes. They did not land on this island, but stayed at anchor for seventeen days. The inhabitants of this island saw that no harm came to them from the ship, so they caught fish and brought them in their little boats. The Spaniards were pleased and gave them glass beads. It seems that Colombo had read in a book that glass beads were valued in that region. When they saw the beads, they brought still more fish and the Spaniards gave them more beads.

One day they saw gold on the arm of a woman; they took it and gave her beads. They told her to bring more gold and said they would give her more beads. The natives went and brought more gold. It seems that in their mountains there were gold mines.

One day they saw someone with pearls. When they gave glass beads for them, more pearls were brought to them. Pearls were found on the shore of this island, in a place one or two fathoms deep. They loaded their ships with brazilwood and took two natives with them and returned within the year to the king of Spain. The said Colombo, not knowing the language of these people, traded with them by signs.

land. Antilia was marked on medieval charts; it was a legendary island to the west, to which seven bishops, fleeing the Arab invasion of Spain, supposedly sailed with their flocks and where they founded seven flourishing cities. It is prominently marked on Martin Behaim's globe of 1492 and its distance from Spain is given in the Toscanelli letter. The name itself may be a corruption of the Arabic transliteration of "Atlantis," the story of which reached Europe through translations of Plato's *Timaeus*. Although Columbus frequently mentions Antilia, it is obvious from his journals that on his third voyage, when he finally reached

favorite bedside reading. His own copy, the margins full of annotations in his own hand, survives in the Biblioteca Colombina, founded by his son Hernando, in Seville. A single quotation from the *Imago Mundi* will show why it fired the imagination of Columbus: "The end of Spain and the beginning of India are not far distant but close, and it is evident that this sea is navigable in a few days with a fair wind."

Columbus was absolutely convinced, from stories he had heard, from his wide and indiscriminate reading and from his very mistaken mathematical calculations that Asia lay only some 3900 kilometers (2400 miles) west of Spain.

Columbus spent years in frustrating negotiations with the Portuguese and Spanish monarchs; his brother Bartholomew laid the plan before the English kings Henry VII and Henry VIII, as well as Francis I of France. Not so well known is Columbus's attempt to gain Genoese backing. This is referred to by Peter Martyr in his invaluable *Decades*, based on interviews with Columbus and other early navigators. After all, at this very time, Genoese bankers were financing sugar cultivation in the Atlantic islands and their agents were well established in Seville, the city from which the early voyages were orchestrated. It was natural for Columbus to approach his countrymen, but the fact that he did so is not very well known; mention of it here – together with the absence of any reference to his negotiations with the Portuguese – again hint at a Genoese source.

The interview with the Spanish king, with the reference to the granting to Columbus of the title *almirante*, of course really happened, although not quite as simply as related here. It is odd that only two ships are mentioned; perhaps the little Niña, of only 50 tons, was not thought worth mentioning.

Kemal Reis's Spanish captive's estimate of the distance between Spain and the New World – 4000 miles, or 6400 kilometers – is much closer to the true distance than Columbus' own, which varied between 1600 and 2400 miles (2500 and 3800 kilometers). Columbus kept two logs, one with the true distance sailed each day – as far as could be estimated – and another with shorter distances so the crew would not realize how far they had sailed and want to turn back. Both figures are considerably less than the 4000 miles mentioned here.

No cannibals were actually encountered on Columbus's first voyage, although the Arawak Indians of Hispaniola and Cuba repeatedly told Columbus of raids by cannibalistic Carib Indians. Columbus at first discounted these stories: "And so I repeat what I have said on other occasions ... the Caniba [Caribs; hence our word *cannibal*] are nothing else than the people of the Great Khan, who must be very near here and possess ships, and they must come to take them captive, and as the prisoners do not return, they believe that they have been eaten." It was only on the second voyage, in 1493, when Columbus reached Dominica and Guadalupe, that cannibals were found.

The island "covered with large snakes" is rather mysterious. Columbus was very interested in snakes, and in the journal of his first voyage carefully noted their appearance, not for herpetological reasons, but because he believed that where there were snakes, there was gold. This belief had the authority of the great Pliny. Although the sources we know of mention snakes -- and iguanas, a favorite food of the Indians -- on a number of islands, including Hispaniola, no island is specifically mentioned as particularly snake-ridden. The trade in glass beads had been going on for years on the Guinea coast, where Columbus had been himself. He had no need to read about "beads for the natives" in a book.

The Spanish didn't only trade beads for gold, but bits of broken crockery, metal tips of boot laces and little bits of leather straps. It is quite true that the Indians were willing to exchange gold for these exotic goods.

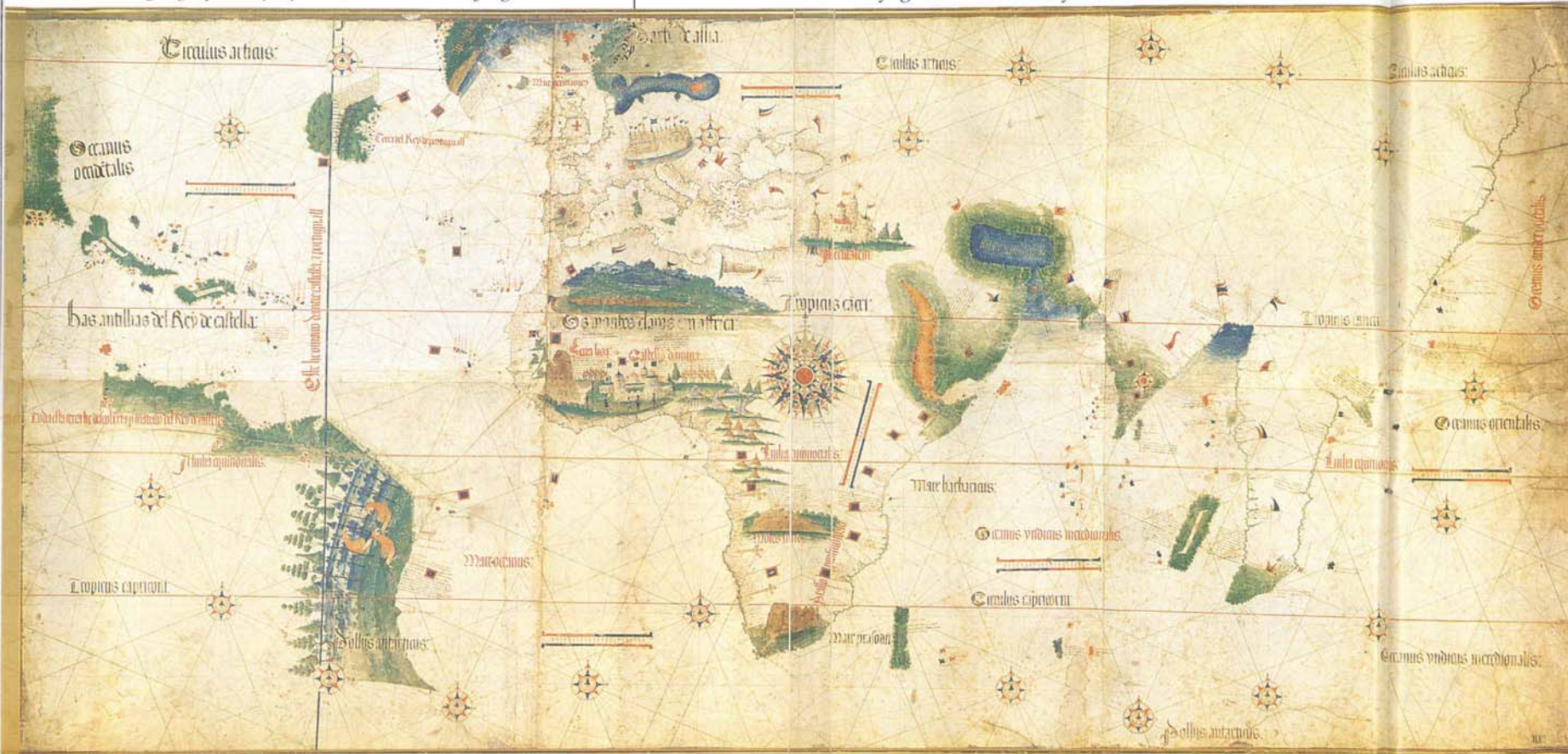
The pearls were found on the third voyage, off the coast of Venezuela, but in large amounts not by Columbus but by Alonso de Ojeda and Pedro Alonso Niño on an independent expedition in 1499. Anyone sailing with Columbus would have learned of this, and of the brazilwood, which was used for dye.

Priests and wheat – rather than barley – were a feature of the second voyage of 1494. Over and over in his journal of his first voyage, Columbus stresses that the Indians "have no creed," and would be easily won to Christianity. Their nakedness was a sign that they inhabited an earthly paradise, innocent of The Fall.

By the time Piri Reis charted these coasts in 1513, in far away Gallipoli, it was true that "these regions have been opened to all," if by "all" we understand "all Spaniards." It is equally possible that Piri Reis means this phrase in the sense of "known to all."

Forty-two place names are inscribed on the islands and coasts of the New World on Piri Reis's map. All but three are transcriptions from Spanish or Portuguese, with the odd exception of one Italian place name – *undizi virgini*, Italian dialect for "Eleven Virgins," the present-day Virgin Islands. The correct name, given by Columbus on his second voyage in 1493, was "*Las Once Mil Virgenes*," after the legend of St. Ursula and the Eleven Thousand Virgins. The word "thousand" had been dropped, and oddly enough, *twelve* little islands are depicted. Paul Kahle thought this single Italian place name went back to Columbus himself, which is possible, although only two annotations in Italian in Columbus's hand are known, both full of errors. Even when writing to bankers in Genoa, Columbus used Spanish, and all the names he gave his discoveries were in that language. It is possible that this name, along with the other references to Genoese discoveries in other captions, goes back to a Genoese source chart.

Some of these names are easily identifiable – *Izle de Spanya* is obviously Hispaniola, modern Haiti/Dominican Republic. The shape, however, reproduces that of "Cipangu" – Japan – on the Behaim Globe of 1492, rather than the true shape of the island. This is



The Cantino Planisphere, drafted by an unknown cartographer in 1502, is the first map to show Cabral's discovery of Brazil. The vertical line on the left separates Spanish and Portuguese possessions under the Treaty of Tordesillas.

After this trip, the king of Spain sent priests and barley. The Spaniards taught the natives how to sow and reap and converted them to their religion. The natives had no religion at all. They went naked and lay about like animals. Now these regions have been opened to all and have become famous. The names which mark the places on the islands and coasts were given by Colombo, in order that these places might be known by them. Colombo was also a great astronomer. The coasts and islands on this map are taken from Colombo's map.

This short account is filled with interesting variations from what we know of Columbus' first three voyages. The first paragraph, which is based on some other source than Kemal Reis's Spanish captive, gives the name Antilia to the coast of the American main-

the American mainland, he thought he had found a province of China.

The mistake about the year of discovery is perhaps not too important; other contemporary writers also got it wrong, and Piri Reis, in the *Kitab-i Bahriye*, later "corrected" it to 1465!

The form of Columbus's name, written *Kolonbo* in the Arabo-Turkish script, again reveals an Italian source. The name of the discoverer of America is "Cristobal Colon" in Spanish, "Cristovao Colom" in Portuguese, but "Colombo" only in Italian.

The book that "came into" Columbus' hands was probably Pierre d'Ailly's *Imago Mundi* (See *Aramco World*, January-February 1992). This late medieval work, printed at Louvain, in today's Belgium, in three volumes between 1480 and 1482, was Columbus's



evidence for the famous chart Columbus took along on his first voyage, showing the location of islands in the western Atlantic. Here is the entry, made in his log on September 25, 1492: "The admiral talked with Martín Alonso Pinzón, captain of the other caravel, the Pinta, concerning a chart which three days before he had sent to him to the caravel and in which, as it appears, the admiral had certain islands depicted as being in that sea." It is possible that Columbus at first marked his discoveries on a pre-existing chart, and this would explain the retention of the conventional shape of Hispaniola. Two other place names occur on Izle de Spanya; *al-Jazira*, which is simply the Arabic word for "The Island," and *Paksin Vidada*, almost certainly Puerto Navidad.

Two names just north of Izle de Spanya may also come from the original chart carried on his voyage by Columbus. They are a word that can be transcribed *istunasid*, which may conceal the imaginary island of Satanazares marked on the Benincasa map, and, near it, Ile Verde, the mythical "Green Isle" marked on so many medieval and Renaissance charts. The variation in the two transcriptions used by Piri Reis for island – *izle* and *ile* – must reflect Spanish (*isla*) and Portuguese (*ilha*) originals respectively.

Another name that is transparent is *Sancuvano Batisdo*, San Juan Bautista, now Puerto Rico. Opposite this island, on what appears to be the mainland, is a purely Arabic place name – *Qal'at Faridat*, "Fort Precious Pearl." There is no reference to anything of the kind in the sources.

The place name *Sancuvano Batisdo* is also applied to another island, in the Lesser Antilles just west of *Vadluq*, which is obviously Santa Maria de Guadalupe. This argues that Piri Reis had more than one chart of the Caribbean; the repetition of this place name and of certain coastal features probably resulted from his attempt to fit together two quite different maps.

The chain of islands in the Lesser Antilles, discovered on the second voyage, is well drawn and most of the names jibe with those given by Columbus.

The proof that the source of the Caribbean section of the Piri Reis map was a map drawn by Columbus is the absence of Cuba. Columbus was convinced that the island of Cuba was part of the Asiatic mainland. He sent his Arabic interpreter, Luis de Torres, into the interior of Cuba with a royal letter of credence to the Great Khan. The failure of this diplomatic mission had no effect on Columbus's obsession, and he forced his crews to sign a statement to the effect that they believed Cuba to be mainland Asia, under pain of having their tongues cut out. That is why Cuba does not appear on the Piri Reis map. The indented triangular point on the "mainland" just west of Izle de Spanya is meant to be Cuba – or to Columbus, the empire of the Mongol Khan.

No one who looks at the southern part of the map can help being struck by the accuracy of the South American coast, derived from Portuguese charts, as the place names show. A caption explains:



A Portuguese ship on the way to India met a contrary wind blowing from the shore. The wind drove it from the coast.... After being driven south by the storm, they sighted a coast opposite them. They approached it ... and saw that there were good anchorages, so they dropped anchor and went ashore in boats.... They stayed eight days, trading with [the] people by signs.... The said bark returned to Portugal without going to India, and made a report. Eight caravels were sent. They described these coasts in detail and this has been copied from them.

This refers to Pedro Alvares Cabral's accidental discovery of Brazil in 1500, on his way to India. As Piri Reis makes clear in his *Kitab-i Bahriye*, the secret of rounding the Cape of Good Hope, at the southern tip of Africa, was first to head far to the southwest to pick up the winds that would drive one around the Cape. Doing just this, Cabral discovered Brazil and spent a

number of days at anchor. Contrary to what Piri says, Cabral did go on to India, but he sent a ship back to Portugal with news of the discovery. The king sent an expedition to Brazil the following year, commanded by Gonsalvo Coelho, aided by the ubiquitous Italian navigator Amerigo Vespucci. Some of the place names along this coast seem to go back to those given by Vespucci. Others are more mysterious. *Sanu Saniyru* must be Rio de Janeiro, but what is *Qatinu*? Is it Cananea, the southernmost point reached by Vespucci? And what of the next four names south – *Izle Matus*, *Ila de Dasane*, *Ila de Viyola* and *Ila de Sara*?

Ila de Sara has a caption: "These islands are uninhabited, but spices abound." This, the unnamed islands nearby and the stylized, indented coastline, seem to repeat Caribbean features. Again, one suspects that an error has been made by trying to reconcile a number of divergent charts. On the mainland an inscription reads: "In this country are found white-haired creatures like this, as well as six-horned cattle. The Portuguese had written this on their maps." What are six-horned cattle?

The last caption to the south, apparently describing the triangular indented coastal feature so reminiscent of "Cuba" in the Caribbean portion of the map, reads: "There is no trace of cultivation in this country. Everything is desolate, and big snakes are said to be there. For this reason the Portuguese did not land on these

They call the country Antilya. Listen and I will tell you of it.

Let me explain how

That land came to be discovered.

There was an astronomer in Genoa

Whose name was Kolon.

A rare book no doubt from the time of

Alexander

Came into his hands.

Everything known about navigation

Was gathered and written in that book.

Finally the book reached the land of

the Franks

But they could not understand it.

Kolon found it and read it;

Then he took it to the king of Spain.

When he told the king its meaning,

The king gave him ships.

My friend, by using that book

Kolon sailed to Antilya

He continued to explore those lands;

So the way there became well known.

His map too has come into our

possession....

Alexander once voyaged

Over all these seas

He wrote down everything he saw

And everything he heard.

Until he had gathered and

written down

All the knowledge of the seas.

Know that this book

Was kept in Egypt.

Later the Franks came to Egypt

in great numbers

And conquered the country.

'Amr ibn al-'As then conquered Egypt.

Now see what the people did!

When they saw Egypt was about

to be conquered,

The leaders of the country fled.

They went to the land of the Franks,

Crossing to the other side of the sea.

And the book I mentioned

That had survived from the time

of Alexander

Was taken with them when they fled.

They came and conquered many lands.

They had that book translated

Entirely into their own language.

If you want to know the truth,

I will tell you who translated it:

It was a man named Bortolomey.

They say he did the translation.

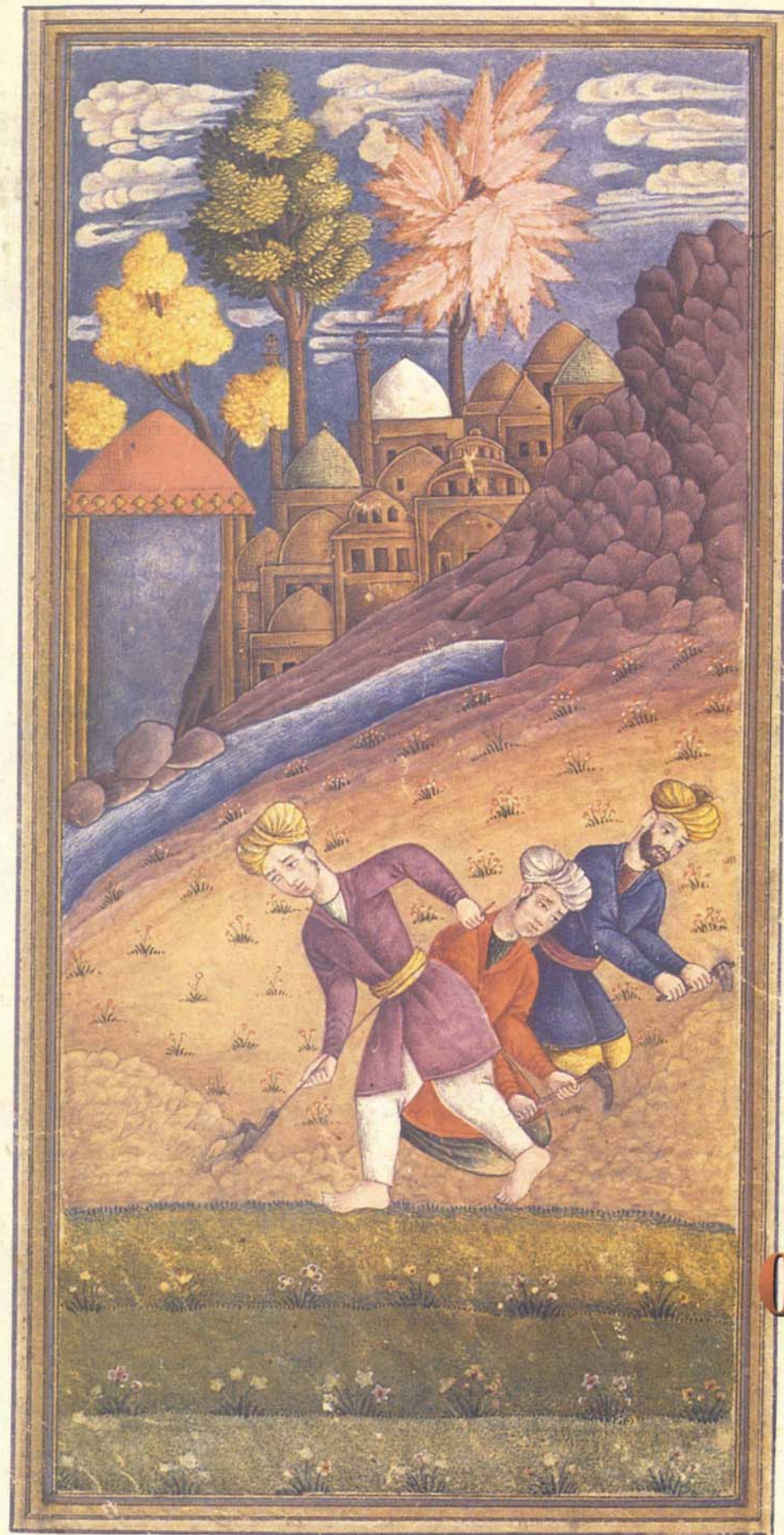
The entire island of Hispaniola is visible in this view from space, above left, taken by the crew of the shuttle *Discovery* in 1990.

Santo Domingo, capital of the Dominican Republic, is easily seen on the south coast.

At left, Italian explorer Amerigo Vespucci uses an astrolabe.

Here again is the story of an ancient book which led Columbus to his discovery. But now it is identified with Ptolemy's *Geography*, Claudius Ptolemy as usual being identified with Alexander's friend and successor. This strange version of the transmission of a classical text, which in fact first reached "the Franks" through versions from the Arabic, has a certain poetic justice. For it was indeed Ptolemy's underestimate of the circumference of the earth that led Columbus to set sail across the Sea of Darkness. ☉





*A 16th-century
author straddled
two worlds, integrating*

A Muslim History of the New World

*the new discoveries with
concepts inherited
from the past.*

At left, three figures in Oriental dress dig for silver on the slopes of the cerro of Potosi, here depicted in the style of a Persian city. The illustration is from the Persian translation of the *Ta'rikh-i Hind-i Gharbi*, or *History of the West Indies*, probably produced in Moghul India in the 17th century. Above right, the planetary system, from the printed Turkish *Ta'rikh-i Hind-i Gharbi* of 1730.

As a reward for his services as a naval officer and cartographer, the Ottoman sultan appointed Piri Reis grand admiral of Egypt, with responsibility for the security of the Red Sea, Arabian Gulf and Indian Ocean – all areas threatened by the Portuguese. His first expedition, in 1547, was a success. He recovered Aden from the Portuguese, storming the fortress and leaving behind a strong garrison to guard this strategic harbor, which controlled access to the Red Sea.

His second expedition, four years later, was a disaster, and cost him his head.

Piri Reis set out with a fleet of 30 ships – galleys, galliots and galleons, as well as the huge fighting barges used by both the Ottomans and the Portuguese.

Caught in a storm off the south coast of Arabia, he lost several barges, but with the remainder of his fleet attacked and seized Muscat. He then besieged Hormuz, but for some reason – some say he was bribed – lifted the siege and sailed up the Arabian Gulf to Basra, probably to refit.

He had already heard from a Portuguese captain he had captured at Muscat that the Portuguese fleet was expected in the Arabian Gulf at any moment. In Basra, he learned that it was approaching, and he decided to abandon most of his ships and escape from the Arabian Gulf before he was bottled up in it by the Portuguese. He set sail hurriedly, taking along three galleys which were his personal property. He lost one of these off Bahrain, but with the remaining two – and the treasure from the conquest of Muscat – he made his way back to Suez.

Meanwhile, the governor of Basra had reported the failure of the expedition to the sultan, who rather precipitously sent an order for Piri Reis's execution. Thus, when the admiral arrived in Cairo, he was beheaded. He was then over 80 years old; in the Ottoman service, the price of failure was high.

Piri Reis was temporarily replaced by the Sanjaq Bey of al-Qatif, who engaged the Portuguese in a bitter sea battle near Hormuz. The Ottomans were outgunned by the Portuguese, and the surviving Ottoman ships were forced to return to Basra. The sultan then appointed a brilliant officer named 'Ali ibn Husayn, better known by his pen-name of Katib-i Rumi, to retrieve the situation.

'Ali's father and grandfather had both been governors of the Ottoman arsenal at Galata, and thus had

been intimately involved almost from the beginning in the creation of the Ottoman navy. They must have known Piri Reis; 'Ali himself had been present at the siege of Cyprus in 1522 and had sailed with the famous corsair Khair al-Din Pasha, the dreaded Barbarossa, as had Piri Reis himself. Like his older contemporary, 'Ali knew the Mediterranean like the back of his hand, and he too had literary ambitions.

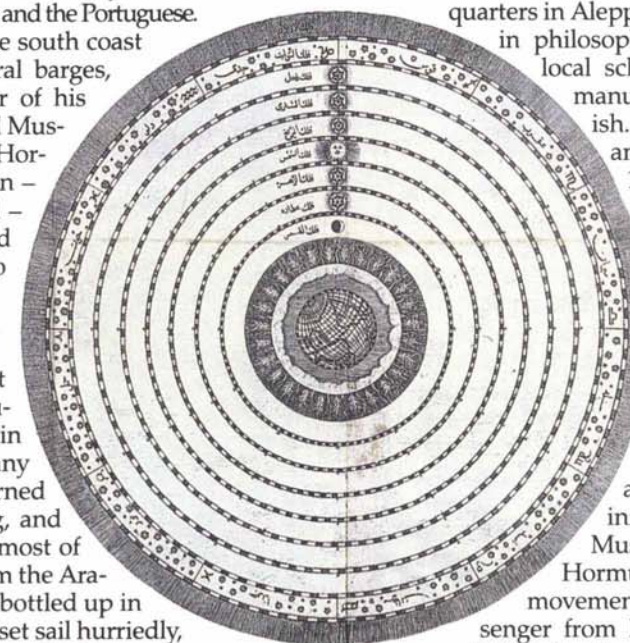
Expert in practical seamanship, 'Ali nevertheless felt the need to deepen his knowledge of astronomy and mathematics, and he had been able to begin these studies in Aleppo in 1548. He had accompanied the sultan on his military expedition against Safavid Persia in that year, which was coordinated with Piri Reis's push against the Portuguese off the Arabian coast, for at this time the Portuguese were uneasy allies of the Safavids. 'Ali and the sultan established their winter quarters in Aleppo, and here 'Ali took lessons

in philosophy and astronomy from a local scholar, translating a Persian manual of astronomy into Turkish. He was able to spend another winter in Aleppo in 1553, during the third campaign against the Safavids. His studies were interrupted when Sultan Süleyman ordered him to go to Basra, rescue the remains of the Ottoman fleet, and convey the surviving ships to Suez.

'Ali went to Basra by way of Mosul and Baghdad, and when he arrived, he was informed that the governor, Mustafa Pasha, had sailed to Hormuz in a frigate to discover the movements of the Portuguese. A messenger from Mustafa then arrived with word that the Portuguese were approaching

Hormuz with only four ships. 'Ali set sail and 40 days later, off the coast of Dhofar, he encountered the Portuguese fleet. Instead of four ships, however, it consisted of three large galleons, six guard ships, 12 galliots and four huge barges. Nonetheless, the two fleets immediately engaged. The battle raged fiercely all day and one of the Portuguese galleons was sunk. At nightfall, the Portuguese sounded the retreat and fled towards Hormuz, the Ottomans in pursuit.

Just off Muscat, a reinforced Portuguese fleet commanded by the son of the Portuguese governor of Goa attacked the Ottomans. Hajji Khalifah describes the battle as more ferocious than the famous sea battle between Khair al-Din and Andrea Doria, the Genoese admiral who commanded the fleet of Holy Roman Emperor Charles V. Portuguese hand grenades, thrown from their war-barges, took a heavy toll. Three Turkish barges were driven ashore, but returned to the battle reinforced with local Bedouins anxious to join



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the fray. During the night a gale blew up and scattered the ships; the sailors were so exhausted from the battle they could not man the oars. They were driven ashore at Makran, in present-day Pakistan, where the governor provisioned them. Setting sail again, they encountered a terrible storm off the southern coast of Arabia that lasted 10 days and drove the surviving ships all the way to India.

'Ali ibn Husayn was finally able to land in Gujarat. He and the survivors of the terrible voyage entered the service of the sultan of Ahmedabad and took part in a number of campaigns against the Portuguese-controlled ports on the western coast of India. It was here in Ahmedabad that 'Ali composed the *Muhit*, a comprehensive work on oceanography, with special reference to the Indian Ocean, Arabian Gulf and Red Sea. This work, whose title of course means "The All-Encompassing Sea," preserves precious material from otherwise unknown works by Arab navigators, and its short fourth chapter is devoted to the Spanish and Portuguese discoveries in the New World. Much of the information it contains was probably derived from oral sources, presumably from interviews with Portuguese captives.

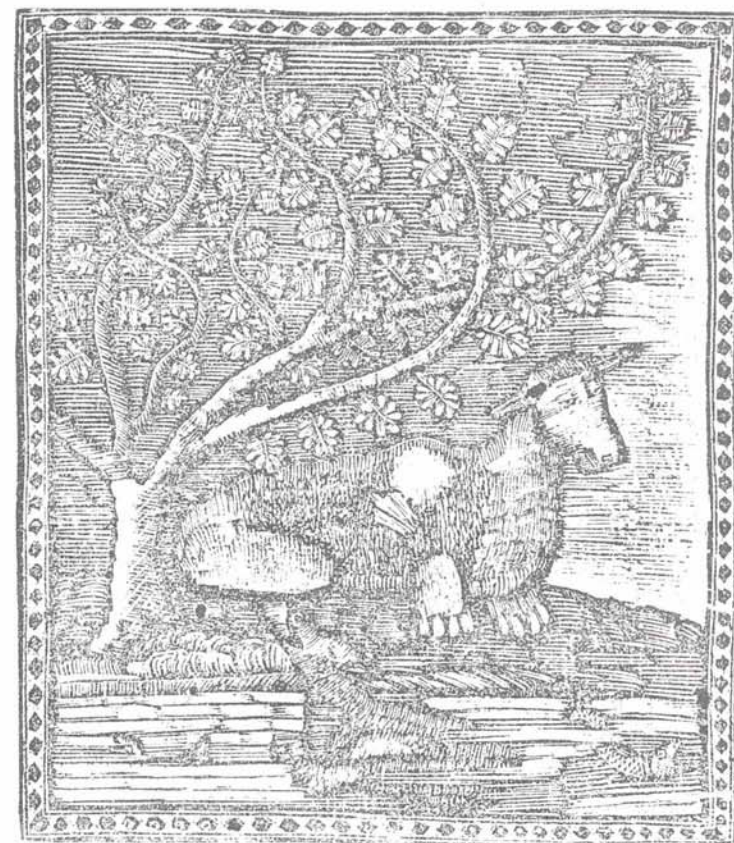
'Ali ibn Husayn was luckier than Piri Reis: He finally made his way back to Constantinople four years after setting out from Basra and, instead of losing his head, received his back pay and a raise. This may have been partly in recognition of the utility of his *Muhit*, and partly because of his extraordinary overland journey from Gujarat to Constantinople through Central Asia, which he described in a book called *The Adventures of Sidi 'Ali*. It may also have been due to his fame as a poet, for his vivid descriptions of the terrors of the sea were highly thought of not only in his own time, but by later generations as well.

By the time 'Ali ibn Husayn was writing, information about the New World was largely academic. Hernán Cortés and Francisco Pizarro had conquered Mexico and Peru, respectively; the complicated administrative system was in place that would prevail until the days of the South American liberator Simón Bolívar, some two and a half centuries later. There were still discoveries to be made, but the outline of the New World was broadly known. The great wave of cartographic, historical, ethnographic and scientific information resulting from the discovery was in the process of being made accessible to the rest of Europe; Spanish books were being translated into most European languages and were becoming increasingly widely available.

The Ottomans, during the 16th century, were fighting simultaneously on a number of fronts. Theoretical problems, such as integrating the Spanish and Portuguese discoveries into the system of geographical concepts they had inherited from classical and medieval writers, could not have seemed very pressing. Though they must have been discussed – 'Ali ibn Husayn must have spoken of such things while studying in Aleppo, for example – the results of

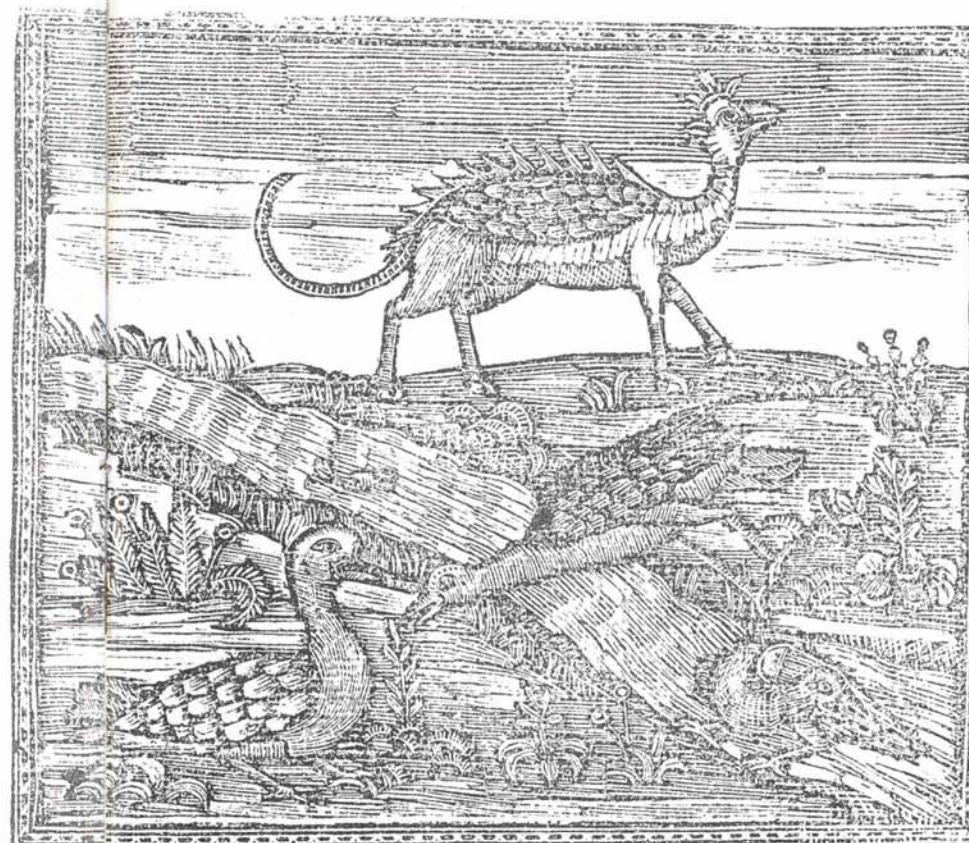
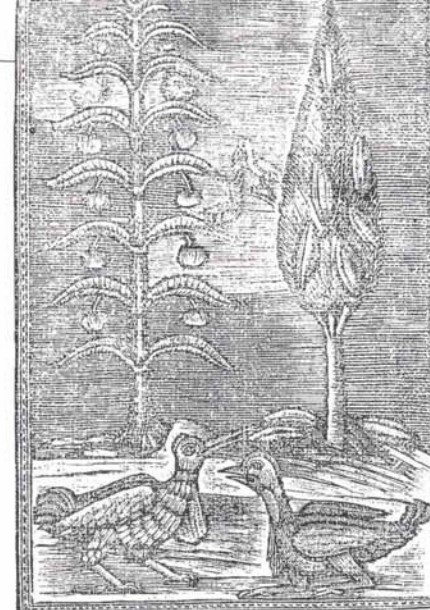
such discussions had not yet found their way into scholarly literature. It is significant that the first two Muslims we know of who concerned themselves with the New World – Piri Reis and 'Ali ibn Husayn – should both have been first and foremost practical seamen rather than scholars. Both the *Kitab-i Bahriye* and the *Muhit* were written by sailors, for sailors.

The first attempt to tackle these theoretical problems took place slightly later in the 16th century, in 1583. This is the date given in the colophon of the earliest known copy of the *Hadith-i Nev*, or *New History*, which is usually known under the title of the printed edition as the *Ta'rikh-i Hind-i Gharbi*, or *The History of the West Indies*.



These charming woodcuts of New World plants and animals, from the 1730 printed edition of the *Ta'rikh-i Hind-i Gharbi*, depict (above) a manatee, or sea cow, resting beneath a tree, her calf in the water at her side and (left) a hunter pursuing a jaguar, an anteater and an armadillo.

A coconut palm and – possibly – a cacao tree, with two unidentifiable birds (right), and a very different armadillo accompanied by a penguin and ducks (below) are shown in miniatures from the 1730 Istanbul printed edition of the *Ta'rikh-i Hind-i Gharbi*.



The author was probably Amir Muhammad ibn Amir Hasan al-Su'udi, as stated in the colophon, although the American scholar Thomas D. Goodrich, who devoted many years to the study of the book and its illustrations and published an English translation in Wiesbaden in 1990 under the title *The Ottoman Turks and the New World*, thinks Amir Muhammad merely revised and embellished the style of the book for presentation to the sultan. Amir Muhammad, however, in a learned pun on the Arabic root of his name (*s-'d*), which he shares with the famous 10th-century historian al-Mas'udi, declares himself a "follower" of the

latter – and indeed, the major authority in the first chapter of his book is al-Mas'udi. This would seem to indicate that al-Su'udi was responsible for the contents, as well as the final form, of the book. The production of two versions of the same book, one for royal presentation and the other for the public, was not unknown at the time; the *Kitab-i Bahriye* exists as both a presentation copy in a more elevated style and a simpler version for ordinary use.

There are at present 19 known partial or complete manuscripts of the *Ta'rikh-i Hind-i Gharbi*, including a Persian translation done in Moghul India. It was one of the first Islamic printed books, produced on the presses of Ibrahim Muteferrika in Istanbul in 1730 (See *Aramco World*, March-April 1981), and the first with figural illustrations; these are woodcuts of great charm, three, according to Goodrich, derived from European sources and the others either based on the text or derived from sources as yet unknown. Although the book has been known in Europe since the 17th century – the French Orientalist Barthélemy de Herbelot devotes a short article to it in his *Bibliothèque Orientale*, the first European encyclopedia of Islam, in 1697, and mentions an Arabic version, now apparently lost – it has aroused hardly any interest in academic circles. A French translation of the third chapter, the history of the conquest of South America by Cortés and Pizarro, was completed in the 18th century but never published. An Italian translation of the same chapter was made exactly 100 years ago, and published to coincide with the 400th anniversary of the discovery of America. But Goodrich – and this writer – seem to have been the only scholars to have taken any interest in it for the past hundred years.

This lack of interest probably derives from the fact that this third chapter is entirely derived from Spanish sources: more precisely, as Goodrich has made clear, from Italian translations of Spanish sources. Unlike the inscriptions on the Piri Reis map of 1513 or the same author's *Kitab-i Bahriye*, it contains nothing that cannot be found in the sources from which it is derived. But the way the author manipulates his sources is of considerable interest. The major source used by the author is Francisco López de Gómara's *Historia General de las Indias*, itself largely a compilation from earlier authorities. López de Gómara was chaplain and private secretary to Cortés after his return to Spain, and never himself visited the countries whose history he describes.

The popularity of López de Gómara's work led to the spread of the story of the "Anonymous Pilot," which may originally have arisen – unless it is true – from an effort to deprive Columbus's heirs of their legal rights by impugning the singularity of his discovery. Be that as it may, it is curious that the three major Islamic versions of Columbus's life – Piri Reis's account, that of the author of the *Ta'rikh-i Hind-i Gharbi* and the one by Elias ibn Hanna – should all have given us variants of the "Anonymous Pilot" story. This is how the story appears in the *Ta'rikh-i Hind-i Gharbi*:

A man named Christopher Columbus was born in the village of Nervi, in Genoese territory. He traveled many lands and many seas and knew the history and landmarks of the entire Mediterranean. He was famous for his maps and well-known for his written works. Intending to travel to the lands of Sind and Hind and visit the coasts and islands of the African Sea, he sailed beyond the Strait and went to live on the Island of Madeira, a possession of the Portuguese, men of evil repute.

A storm-tossed ship manned by a captain and two sailors was driven ashore by chance. When it reached the island, the two sailors died and only the captain survived, although very ill. Columbus took pity on him and took him to his house. He fed and cared for him for several days, and asked him for an account of his adventures.

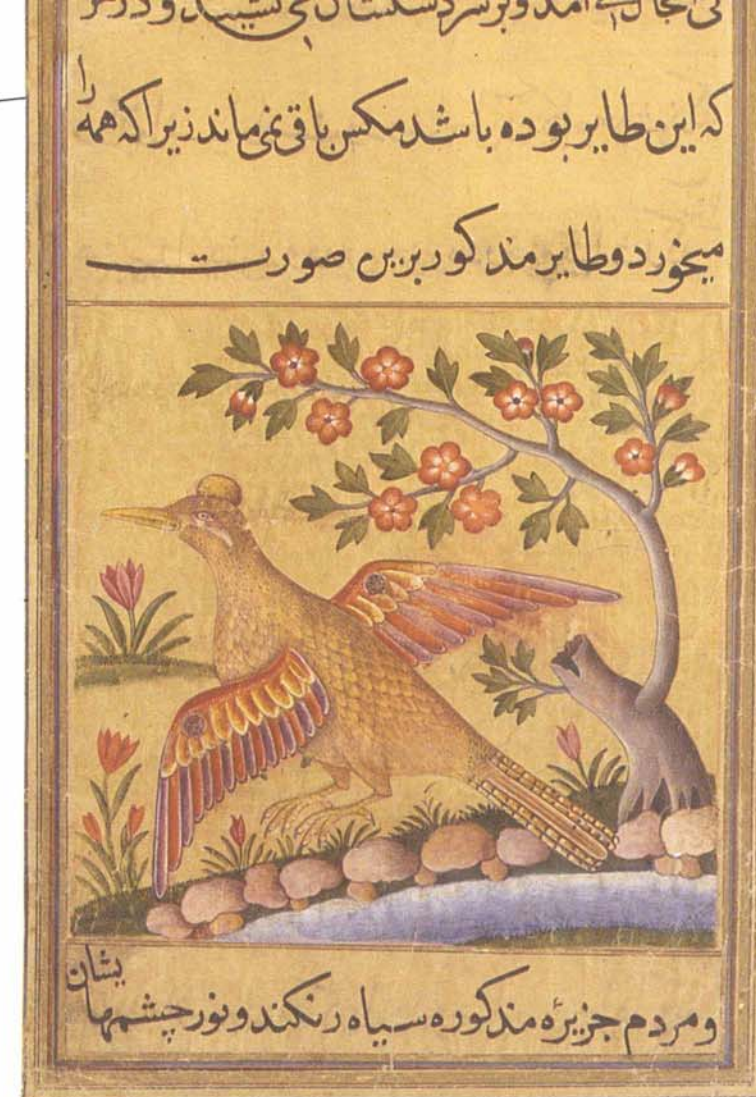
"We were sailing off the North African coast," said the captain, "on a trading voyage. A head wind suddenly blew up and drove us into the Atlantic Ocean. Driven before it for some time, we sighted numberless islands and coasts. The wind finally turned and we made our way back. Most of the crew died by the sea's violence. You can see for yourself the condition I am in; the treacherous sea has made me a sorrowful grave."

The captain died two days later but his story affected Columbus profoundly and the idea entered his head of becoming famous by finding those lands....

The author's technique of translating, rearranging and selecting can be easily seen by comparing this passage to López de Gómara's original, which gives more information about Columbus's origins, boyhood and travels in the Levant, but does not mention his intention to travel to the East. The reference to "Sind and Hind" – though it literally means what is now Pakistan and India – is a poetic way of referring to the Far East in general. The author is apparently implying that at this early date Columbus had already formed the plan of reaching the Indies by sailing west. He retains the original's reference to Columbus's map-making activities, but adds "written works" to his achievements, which is not in the original. He doesn't mention Columbus's marriage, which is.

The next paragraph in the Ottoman version describes the voyage of the "Anonymous Pilot" in the Atlantic. The material comes partly from López de Gómara's previous chapter, where the number of the crew is given as "three or four," not two, and partly from the chapter he has just translated. The Ottoman author puts the pilot's story into the first person, in good novelistic fashion, and adds a few details that are not in López de Gómara. He also omits a great deal that is, in order to give a clearer and simpler narrative. He leaves out almost all of the political background and intrigues that are given in such detail by López de Gómara when he writes of the careers of Cortés and Pizarro. Instead, he chooses episodes that would appeal to a popular audience.

He several times interrupts the narrative to make rather unrealistic pleas for the sultan to carry the war against the Hapsburgs into the New World; although



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A tree probably intended to be either a coconut palm or a papaya, also from the Persian *History of the West Indies*. Illustrations such as these were made from verbal descriptions rather than personal observation.

corsairs from the Moroccan port of Salé preyed on Spanish treasure ships returning from the New World, ships flying the Turkish flag never seem to have penetrated the Caribbean, as English, French and Dutch ships did. When telling the story of Columbus's interview with King Ferdinand – Queen Isabella is not mentioned – during the siege of Granada, the author takes the opportunity to interpolate a long passage lamenting the loss of that city and the Spanish capture of fortresses along the North African coast, and recalling the great days of Khair al-Din. He ends with a description of the Great Mosque at Córdoba and its famous minbar, or pulpit, taken from earlier Arabic sources.

Although López de Gómara is the principal source for the *Ta'rikh-i Hind-i Gharbi*, the author also referred to other works, including the *Decades* of Peter Martyr, the writings of Agustín de Zárate and even, toward the end, to Gonzalo Fernández de Oviedo y Valdés, the official historiographer of the Indies. From the latter he derived the descriptions of unusual New World plants and animals with which the book closes; some of these are represented in the illustrations. This emphasis on "wonders" is reminiscent of the popular late-medieval "wonder books" that were characteristic of 13th- and 14th-century literature in both the Islamic world and Europe.

Above, a fabulous New World bird from the Persian translation of the *Ta'rikh-i Hind-i Gharbi*.

This is particularly evident in the first chapter of the *Ta'rikh-i Hind-i Gharbi*, which is a summary of medieval Islamic geographical knowledge, cast in the form of the *Aja'ib al-Makhlūqat* (*The Cosmography*) of Zakariyya al-Qazwini, a sort of cosmological and geographical encyclopedia, written in the 13th century, which enjoyed a great vogue. Another important Arabic source for the first chapter is al-Mas'udi's *Muruj al-Dhahab*, or *Meadows of Gold*. The dimensions of the earth are given, its circumference stated as 24,000 miles, a figure going back to Ptolemy. The length of a degree is given as 56 miles, following al-Farghani; this is the famous "short degree" used by Columbus, who claimed to have re-calculated it (See "Al-Farghani and the 'Short Degree,'" in this issue). The seas, continents, mountains and rivers are enumerated. An island between the coasts of Yemen and Ethiopia has a miraculous fountain, the waters of which clear the mind, improve the memory and make the drinker wise. There is a tree that grows on an island off Uman; its fruit is a cure for most illnesses. An old man who eats of its fruit recovers his youth.

The author is not uncritical, however. At one point in his first chapter he retells the old story of Alexander

the Great and the Caspian Sea. This was a favorite with medieval Muslim writers:

Wishing to learn the extent of the Caspian Sea, Alexander equipped a ship and crewed it with men and women from the various peoples who inhabited the southern shore. He told them to sail the sea for a year and then return. They set sail, and exceeding Alexander's orders, sailed for 13 months without seeing anything but water. Then they met another ship, much the worse for a long voyage. They questioned the voyagers, but not having a language in common, were unable to communicate with them. So Alexander's sailors gave one of their women to the men they had met, and received a man in exchange. Then they returned to Alexander's encampment.

Alexander married the man to a woman from among his followers, and they had a child. When the child had reached the age of reason, he was able to interpret for his father, and thus Alexander learned of the lands that lay to the north. He discovered that these were ruled by a king even more powerful than himself, and that just as Alexander had done, this king had sent an expedition to learn of lands to the south, and that they had sailed for two years and two months before encountering Alexander's ship.

The author of the *Ta'rikh-i Hind-i Gharbi* points out that this story is ridiculous, for the length and breadth of the Caspian are well-known, and the sea can be crossed in a short time. He goes on to say, however, that the story would make sense if it originally applied, not to the Caspian, but to the Atlantic Ocean. "It is possible," he says, "that the ship that has been mentioned came from the New World." He is thus the first Muslim author to speculate on the possibility of pre-Columbian voyages!

But it is in the short second chapter of the book that the author breaks with tradition. He quotes al-Mas'udi to the effect that the All-Encompassing Ocean cannot be crossed, and that its boundaries are unknown, just as Ptolemy says. He retells al-Mas'udi's story of the Pillars of Hercules, inscribed with a warning that there is nothing beyond, and no man lives there (See "Pillars of Hercules, Sea of Darkness," in this issue). He then tells of the voyage of Khashkhash, still quoting al-Mas'udi, quite aware that this contradicts what has immediately gone before. And then, a few paragraphs later, he says: "This poor author states that in the first years of the 10th century of the Hijra [about AD 1495] a number of brave men from Andalusia sailed the waters of that terrible ocean, far into its midst, and so overcame the talisman that protected this forbidden treasure, and found the boundary of this boundless sea."

With these words the 16th-century author of the *Ta'rikh-i Hind-i Gharbi* puts to rest the legend of the inviolability of the Atlantic Ocean – a legend that had gripped men's minds for more than 2000 years, and which had probably first been propagated by Phoenician sailors to protect their monopoly of Atlantic trade. ☉



و دیگر قویا به نام درختی میباشد که برکش مثل
برک درخت توت است و لکمه اندکی خورد تر است





A world map from 1570 by Flemish cartographer Abraham Ortelius, who was influenced by the great German geographer Gerardus Mercator. This and other maps were part of the first modern atlas, which long remained the basis for geographic works.

Economic facts had international effects, even in the 16th century.

American Silver, Ottoman Decline

The city of Potosí and the silver-bearing *cerro* behind it, as they appear, at left, in a woodcut from the *Ta'rikh-i Hind-i Gharbi* of 1730 and, at right, in a contemporary view. The mines of Potosí were the source of the silver that flooded the economy of the Ottoman Empire. Left page, silver cob eight-reales coins – pieces-of-eight – minted in Mexico City in the reign of Philip IV. Two are dated 1652 and 1653.

The gold which arrives in Mali is divided into three parts. The first goes with the caravan from Mali to... Syria and Cairo. The second and third parts go by caravan from Mali to Timbuktú, and then divide in two, one going... to Tunis and the Barbary coast and the other to... Oran and Tlemcen,... as well as to Fez, Marrakesh, Arzila and Massah, places outside the Strait. And in those places we Italians and other Christians buy it, in exchange for certain merchandise which we give them.

This was written by the discoverer of the Cape Verde Islands, the Venetian captain Alvise da Ca' Da Mosto, who explored the Gambia for Portugal in 1456 as part of Prince Henry the Navigator's push down the West African coast. The capital of the empire of Mali was Niani, on the Niger, visited on a diplomatic mission by Ibn Battuta in 1352. It was here that the fabled gold of Wangara was brought by the pagan tribes farther south and exchanged for an equal weight of salt. There was a large Egyptian merchant colony in Niani, for the gold of Wangara – or Bambuk – was the lifeblood of the Mamluk economy.

Da Ca' Da Mosto's report, written a hundred years after Ibn Battuta's visit, cites a significant disruption in the flow of gold from sub-Saharan Africa to Egypt. One-third of the production of Wangara was by then finding its way to Europe instead of to Egypt. This drop had drastic consequences for the Mamluks.

Yet even before the Portuguese managed to deflect part of the gold from the western Sudan to Europe, the supply to Egypt may already have been impaired. In 1425, two years after making the sugar industry a state monopoly, the Mamluk Sultan Barsbay devalued the *dinar*, the Islamic gold unit of currency, fixing its weight at 3.45 grams of gold instead of 4.25. This was the first economically motivated devaluation of the *dinar* in Islamic history. (A previous devaluation from 4.55 to 4.25 grams by the Umayyad Caliph 'Abd al-Malik ibn Marwan in the early years of Islam was a technical correction, made primarily to streamline measurement.)

The economies of Europe, in particular those of the southern Mediterranean, were intricately linked with the economies of the Levant, and these in turn with India, China and the great island chains of the Indian Ocean. A single disruption of the pattern, such as the

interruption of the gold supply to Egypt noted by da Ca' Da Mosto, had serious effects throughout this system, even thousands of miles away.

Even more serious for the Mamluks was the shortage of silver. Toward the end of the 14th century, the silver content of the *dirham* coin was reduced, perhaps because of the interruption of silver supplies from Central Asia, caused by the conquests of Tamerlane. As the century turned, silver coins disappeared, and were replaced with copper ones. The copper was bought from the Venetians, who obtained it from mines in Eastern Europe. Small copper coins, based on Byzantine issues and called *fals*, or *fulus* in the plural, had been known in the early centuries of Islam but

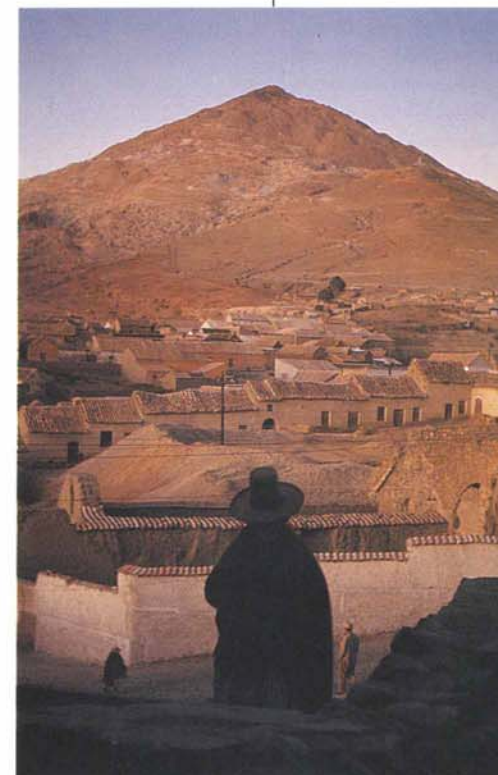
had then virtually disappeared – though *fulus* still means “money” in colloquial Arabic today. The reinstitution of a copper coinage during late Mamluk times was directly related to the sudden scarcity of silver.

The Mamluks' two major sources of silver were Transoxiana and Europe. There are indications that the supply from Europe was dwindling; silver had become more valuable and less of it was now being exported. Increasingly, Venetian merchants were paying for valuable spices with merchandise rather than silver coins, and the Levant was being flooded with European goods – paper, soap, woolens and even silks. The growth of the sugar industry in the southern Mediterranean and the Atlantic islands must also have reduced Mamluk revenues, for sugar had long been a

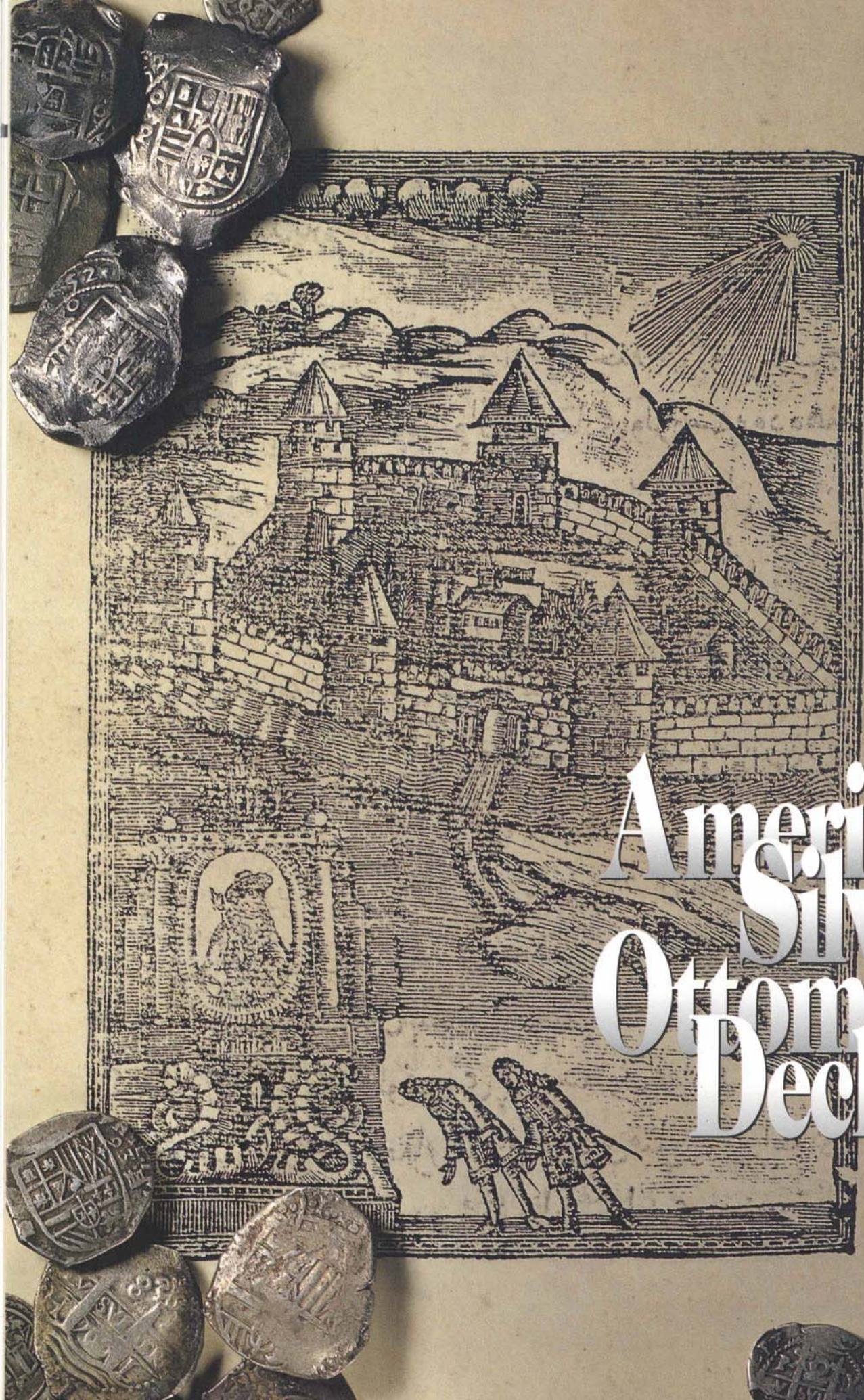
major export for Egypt.

Exchanging salt for gold in Mali was good business; so was the spice trade. Even toward the end of the 15th century, despite massive population losses due to plague, and the consequent rises in wages and inflation, the Mamluk balance of payments must have been very healthy. But military expenditure was very high and canceled out any surplus: The Mamluk sultan Qa'it Bey, in the 15th century, fought 16 wars, costing his treasury more than seven million *dinars*. A significant fact shows how far this economic breakdown had gone: In 1490, two years before Columbus reached the New World, the inhabitants of Cairo started eating barley bread, after being net exporters of wheat for centuries.

Twenty years later, in 1517, Mamluk rule came to an end when the Ottomans conquered Syria and Egypt.



SERGIO LARRAIN MAGNUM



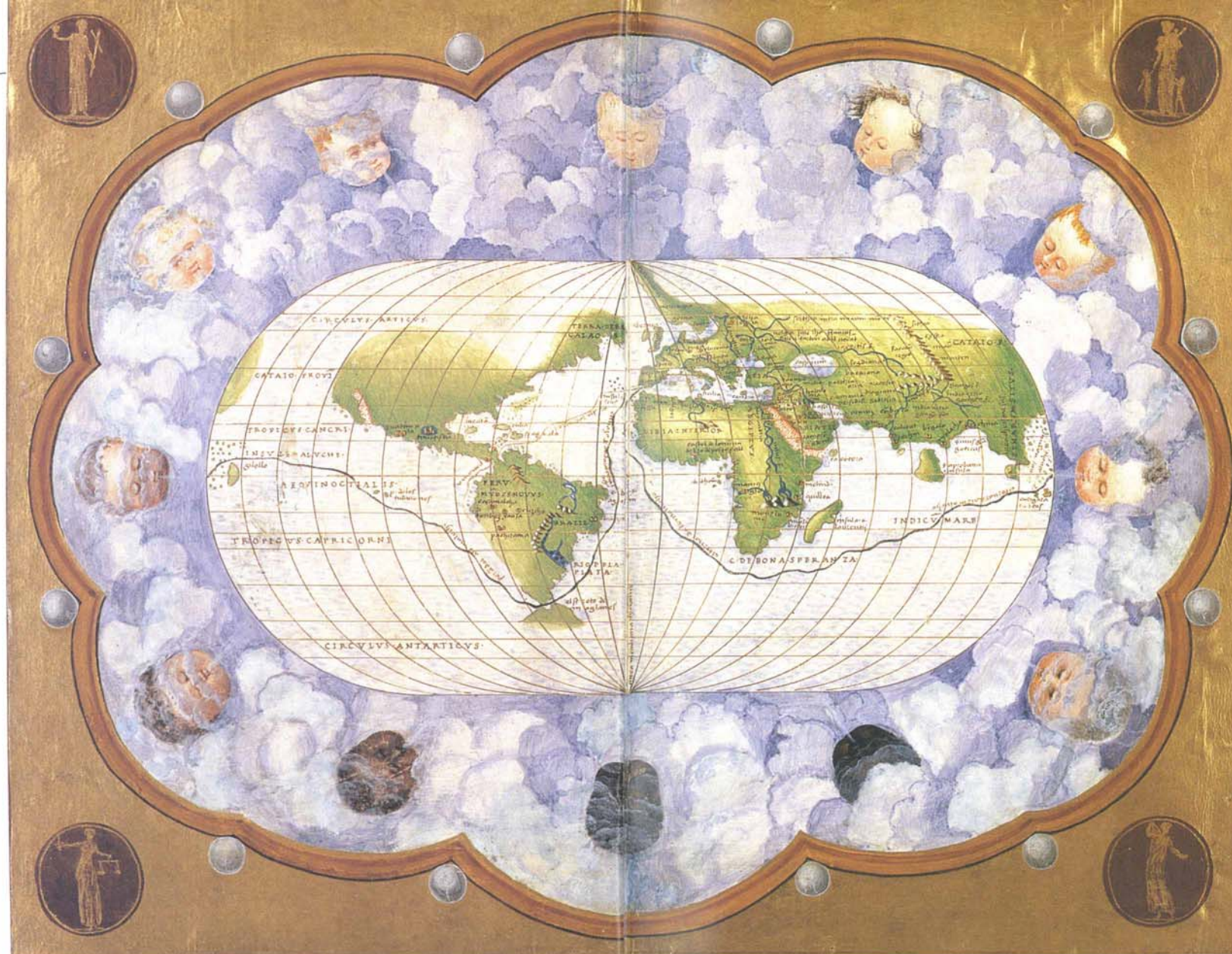
The Ottoman economy too was vulnerable to events in far-off lands, but this time not south of the bend of the Niger, but far across the Atlantic, in the silver mines of Peru.

Gold, silver and petroleum are all found in inaccessible places, but there can be few places more inaccessible – and inhospitable – than Potosí. This silver-mining town, located in what is now Bolivia, lies some 4200 meters (13,700 feet) above sea level, perhaps the highest town in the world. The great sugarloaf-shaped *cerro*, or hill, where the mines are found rises another 600 meters (2000 feet) beyond that. “This mountain is famous throughout the world for its great riches,” says Elias ibn Hanna, the Arab traveler,

...for they have taken wealth past counting from it for 140 years.... There work in the interior of the mountain, cutting stone, seven hundred Indians belonging to the men who have bought a share in the mountain from the king. These Indians are specially assigned to the work by an order of the king, and every mine owner has a specified number of Indians in his mine. It is stipulated in the king's order that every Indian town must supply men to work the mines. The law states that one out of every five men must be given over to this labor. If the village headmen do not supply them, the viceroy removes them from office. When these Indians come to the town of Potosí, the governor divides them among the mines.

Silver ore was discovered on the Potosí *cerro* by an Indian shepherd in 1545; two years later, a town was laid out on a grid plan and production began. But it was the “invention” in 1571 of a revolutionary mercury amalgamation method of silver refining that was responsible for the enormous productivity of Potosí. This technique, new to the Spaniards, increased the amount of silver recovered from the ore about 10-fold. Mercury, or quicksilver, was available from the mines at Huancavelica, in present-day Peru. Elias describes the method he saw used:

There are 37 mills in this town which crush the silver ore night and day, Sundays and holidays excepted. After the ore is pulverized, they take 50 quintals [about two and a half tons] of it and pile it up on a heap and mix it with water... then they add as much quicksilver as is necessary, mix it with water and stir it with trowels a number of times. If it requires more quicksilver, they add it until the proportions are right.... When it is ‘cooked’ and completely amalgamated, so that it gleams when spread on a shard, they put it in a trough and let water flow over it and mix it well. The silver and the quicksilver adhere to the bottom and the water washes away the dust. After they finish washing the mixture, they close the trough and drain out the water and clean it. Then they remove the silver and quicksilver, which have amalgamated. They put the mixture in bags of sackcloth and hang them up, placing cow-hide boxes underneath. The quicksilver runs out of the bags and falls into the hide boxes. The pure silver keeps the shape of the bags, like molded cones of sugar.



Ottoman silver *akçes* (page 35 and this spread) minted by sultans from Murad I to Ibrahim in the period between AD 1360 and 1640. Above, the Agnese world map of 1543, which shows both Magellan's route around the world and, in gold color, the route by which American silver – though not yet silver from Potosí – traveled the world. At left, the open-pit mercury mines at Huancavelica, still productive today and the largest in Latin America.

This amalgamation technique for extracting silver had been used in Islamic lands for centuries in refining not only silver but also gold. The Muslim scholar al-Biruni, writing around the year 1000, describes an amalgamation process very similar to the one Elias ibn Hanna reported almost 700 years later: “After pounding the gold ore or milling it, it is washed out of its stones, and the gold and mercury are combined and then squeezed in a piece of leather until mercury exudes from the pores of the leather.” Quite possibly the Spanish “inventor” of the process, Pedro Fernández de Velasco, learned it from Muslim miners in Andalusia or North Africa.

After mercury amalgamation was introduced, the silver production of Potosí grew dramatically, flooding Spain, Europe and the Ottoman Empire with the precious metal. The effects were felt even farther afield. It has been estimated that one-third to one-half of the silver production of Potosí ultimately found its way to China, for it was during these very years that the Manila galleons – sailing ships linking Spain's col-

ony in the Philippines with the New World – first began the Pacific run.

The effect of all this silver was exactly what one might expect: severe inflation, first in Europe, then in the Ottoman Empire. This inflationary trend had begun even before Potosí, toward the end of the 15th century, so Peruvian silver was not the sole cause. But until the mid-16th century the Ottoman state, with its productive silver mines in Serbia, Thrace and Macedonia, had an abundant surplus and a relatively stable coinage. In 1584, the silver coinage began to be devalued, in an effort to balance the budget – almost certainly because of rising prices.

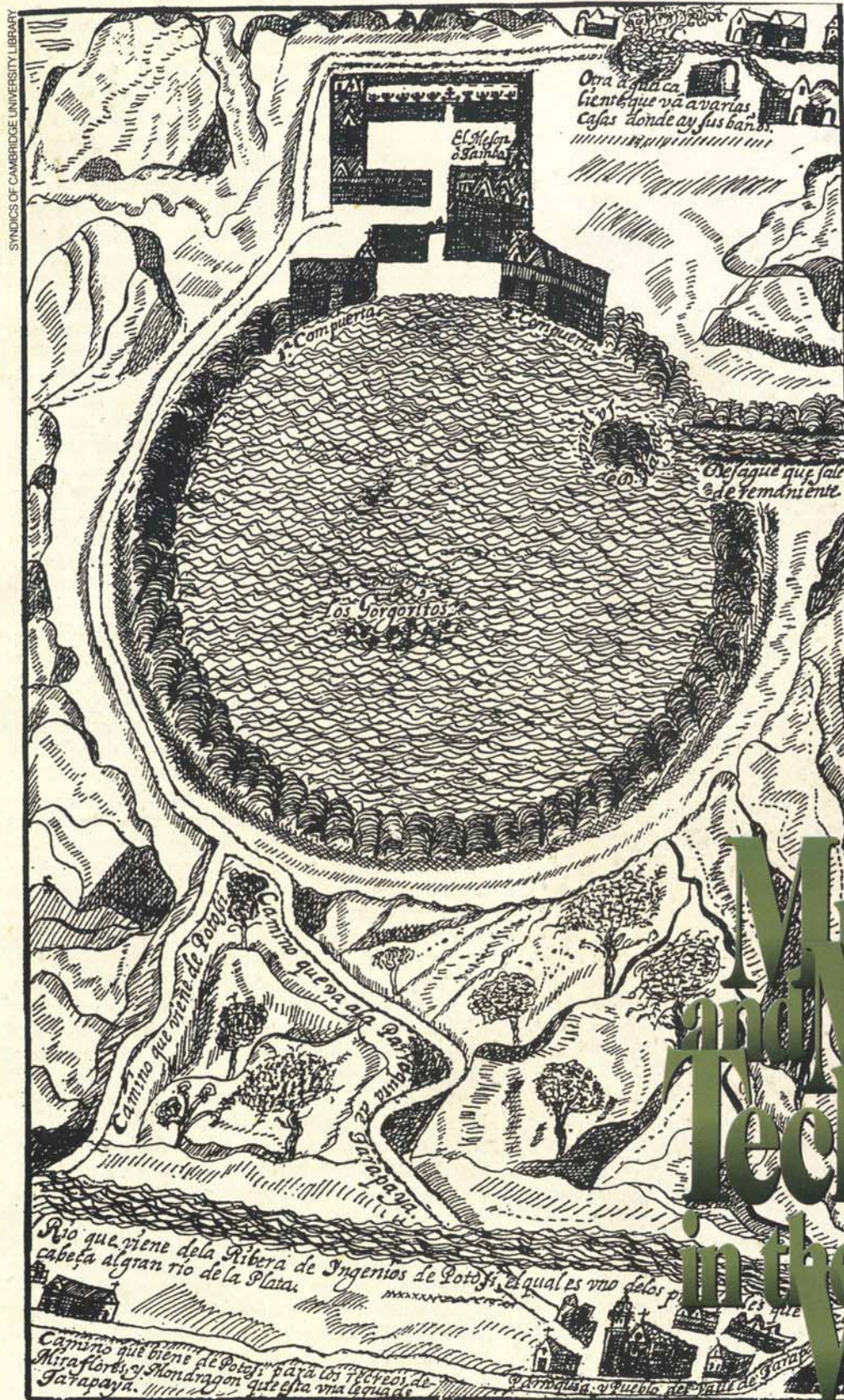
The “price revolution” that hit Europe after 1550 and the Ottoman Empire after 1580 led to great social unrest. Spain's enormous military expenditures, for example, led to increasing bankruptcy; despite the quantities of American silver flooding into the country from Peru, the Spanish crown was constantly in debt and the silver found its way into the hands of the bankers, first of the Low Countries, then of Italy, to service these debts. Spain itself became increasingly impoverished. People living on fixed incomes found it more difficult to make ends meet in the inflationary situation: This was particularly true in the Ottoman Empire in the 1580's.

The Ottomans too were engaged in expensive wars, in Europe and with Persia – a situation made worse by an expanding population. Instead of suffering from a shortage of precious metals, as had periodically afflicted the late Mamluks and early Ottomans, the Ottoman Empire was now drowning in silver, but paradoxically becoming much poorer.

Government officials could no longer live on their salaries; the Janissaries, backbone of the Ottoman war machine, could not live on their pay. In 1589, the Janissaries rebelled because they were being paid in debased coin, and more and fiercer rebellions followed. Peasants fled from their land and holders of estates, or *timar*, could no longer fulfill their military obligations. Much land went out of cultivation, either falling into the hands of speculators or reverting to the government. Agriculture could not keep pace with the burgeoning population. Soon bands of uprooted peasants were roaming the countryside and insecurity plagued the cities.

The wandering bands of landless peasants were called *levandats*; many of them had served in the wars and there was a very real danger at century's end that they might actually take power. Rebellions broke out everywhere in Asia Minor between 1596 and 1610; the rebels were called *jallali* and their depredations were so terrible that Elias ibn Hanna, writing 70 years later, uses the word *jallali* for the “wild Indians” he encountered in South America.

The *jallali* revolts were ruthlessly stamped out in the early 17th century, but the causes of discontent remained. Partly as a result of the flood of silver from the New World, the powerful Ottoman state lost its initial vigor and began its long, slow decline. ☉



The New World's
resources,
combined with
people, plants
and technologies
from the Old,
vastly expanded
the global
economy.

Muslims and Muslim Technology in the New World

Opposite, the lake of Tarapaya, one of the sources of hydraulic power that ran the ore-grinding mills at Potosi, illustrated in the 18th-century *Historia de la villa imperial de Potosi* by Arzans y Vela, who also recounts the story of Amir Çiğhala. Above right, a botanical illustration of sugar cane, from Descourtiz's *Flore pittoresque et medicale des Antilles*, 1883.

Between 1609 and 1614, some 300,000 *moriscos* were expelled from Spain. These were people of Muslim descent who had remained in the country – particularly in Andalusia, Valencia and Aragon – after the fall of Granada to the Christians in 1492. The majority were craftsmen and market-gardeners, whose *huertas*, or vegetable gardens, had contributed so much to the agricultural prosperity of Spain. In the 117 years since the extinction of Muslim power in the peninsula, an increasing number of laws had been promulgated by the Spanish crown against the *moriscos*, limiting their freedom of worship and their use of Arabic language, dress and customs. Revolts had inevitably followed, in Granada and in Valencia. It was an effort to aid *moriscos* involved in a revolt in the latter city that had brought Turkish admiral Kemal Reis and his nephew Piri into Spanish waters in the year 1501 (See “Piri Reis and the Columbus Map,” in this issue).

Moriscos, along with Protestants, Jews and Gypsies, were forbidden to travel to Spanish America. Even Italians from the Spanish possessions of Naples and Sicily were not welcome. An elaborate bureaucracy was set up in Seville to screen prospective immigrants; regulations were complex and very time-consuming, and it was not at all easy to get the coveted *licencia* that entitled one to set sail for the New World. Once obtained, the travel permits were not transferable and were valid for only two years, but travel without them was dangerous: The earliest penalty recorded for shipping out without a permit was four years in the galleys for ordinary culprits and 10 years’ exile in Oran – the Algerian seaport, then held by Spain – for persons of quality. In 1607, a new law instituted the death penalty for voyagers without a license. Laws stipulating these and other punishments were frequent in the late 16th and early 17th centuries; their very number indicates the scope of the problem. Large numbers of “illegal immigrants” were clearly finding their way to Spanish America.

It is impossible to say how many of these were of Muslim descent. Between 1493 and 1600, 54,881 Spaniards emigrated to the New World, a figure based on

surviving documents studied by Peter Boyd-Bowman, a specialist on the language, trade and demography of the period. Allowing for missing documents and illegal immigration, the true figure was perhaps on the order of 100,000. Of the 54,881 “legal” emigrants, 1522 were foreigners – Flemings, Germans, Englishmen, Greeks – who for special reasons had been granted *licencias*, just as Elias ibn Hanna had been (See “The New World Through Arab Eyes,” in this issue).

Obviously, since it was illegal for *moriscos* to go to the New World, they do not appear as such in the *listas*

de pasajeros in the Archive of the Indies in Seville. Yet from very early times, perhaps from Columbus’s first voyages, male and female *moriscos* are mentioned in the literary sources. Beatriz La Morisca took part with Francisco Pizarro in the conquest of Peru, along with Isabel Rodríguez, “La Conquistadora.” For anyone with the will, there was always a way to the New World, either through simple bribery or by more complex means. A single example will show how individual initiative could succeed in overcoming bureaucratic regulations.

This story occurs in the fascinating *Historia de la villa imperial de Potosi*, by Nicolás de Martínez Arzans y Vela, composed around 1705. In 1561, a certain Captain Giorgio Zapata, who claimed to have been in the service of the duke of Medinaceli and the viceroy of Sicily, arrived in Potosi. He apprenticed himself to a German miner – who had presumably been allowed into Peru because of his specialized knowledge – discovered a very rich silver

vein, and for 10 years developed it in partnership with a man named Rodrigo Pelaez. Zapata became one of the richest men in Potosi, and one of the most respected as well.

After 15 years in Potosi – it must have seemed a lifetime in that cold, inhospitable place – Giorgio Zapata decided to return to his country. He gave gifts to all his friends and bid them good-bye, taking with him 2,000,000 pieces of eight and 138 kilos (304 pounds) of pure gold. But instead of sailing to Spain, Zapata went to Istanbul and presented himself to the sultan, Murad II. Istanbul, it turned out, was really his native



city, and his real name was Amir Çighala. He gave the sultan part of the gold he had brought from Potosí and became admiral of the fleet. He subsequently had a very successful naval career and was later named governor of Algiers.

Meanwhile, his old partner, Rodrigo Pelaez, had retired to Spain. In 1596, while he was at Cádiz waiting for a ship to Peru, the English, led by the earl of Essex, sacked the city and captured Pelaez. Sold first to a Frenchman, and then, after a number of resales, to a North African, Pelaez eventually found himself in Algiers, where he was purchased by Kara Çighala, the older brother of his old partner from Potosí. The two friends were re-united, and Amir Çighala told Pelaez how he had secretly practiced Islam for 15 years in Potosí. Two months later, he sent his old friend back to Spain a free man, laden with gold and other gifts and a letter written in good Spanish "with some phrases in Arabic," telling the whole tale.

Amir Çighala must have been related to the famous Yusuf Çighala-Zade, known as Sinan Pasha. The son of the viscount of Cicala, a Sicilian noble in the service of Spain who had married a Turkish woman, he entered Ottoman service and rose to high office, marrying two granddaughters of Sultan Süleyman in succession. He was high admiral of the Ottoman fleet in 1591 and took part in the successful siege of Eğri in the Balkans in 1596, whose main purpose was to ensure Ottoman control of the extensive mines in the region. Perhaps Amir Çighala was his younger brother.

The story shows the great mobility that characterized the 16th and 17th centuries, and how permeable both political and religious barriers were in fact, despite the elaborate bureaucracies so characteristic of both Hapsburg Spain and the Ottoman Empire. Amir Çighala may have been far from an isolated case, judging from an account that tells of 20 Turks who were "redeemed out of captivity by Sir Francis Drake in the West Indies" and repatriated by order of Queen Elizabeth I.

So, counting Amir Çighala, at least 21 Turks had gone to America before 1586. There were probably others. It is hard to form any clear idea of the numbers of people involved, however: Only five persons were brought before the Inquisition in Lima during the 16th and early 17th centuries charged with being "secret" Muslims. On the other hand, it required considerable finesse for Amir Çighala, a Turk, to spend 15 years in Peru as a covertly practicing Muslim without arousing suspicion; the task would have been much easier for Muslims who were also native-bred Spaniards. And it is curious that fashions such as the *tapada*, a long shawl covering most of the body and leaving only one eye free, originally developed in Andalusia to evade the prohibition of the veil, should have become fashionable wear in 16th- and 17th-century Lima.

Of much more significance than the physical presence in America of Spaniards of Muslim descent is the transfer from the Old World to the New of agricultural products and associated technologies

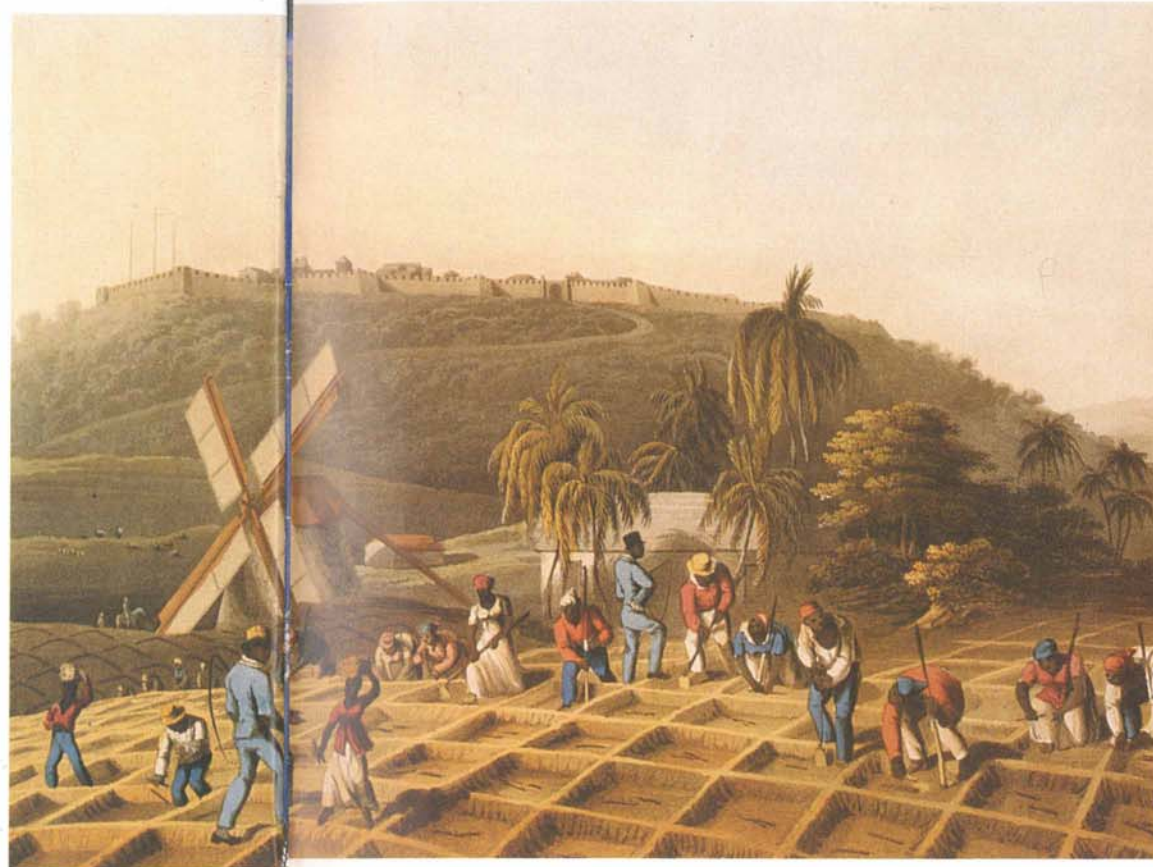
originally elaborated in Muslim lands. Boyd-Bowman calculated that 37.9 percent of the Spanish immigrants to the New World between 1493 and 1600 came from Andalusia; it is no surprise that the crops they turned to in their new environment should be those with which they were familiar. The two most important of these were sugar (in Arabic, *sukkar*) and cotton (*qutn*), both introduced into the Iberian Peninsula and the Maghrib by the Arabs.

These were the two cash crops par excellence of the late Middle Ages. After the severe population losses in the 14th century due to repeated outbreaks of the Black Death, great tracts of land in Syria and Anatolia, formerly devoted to cereal cultivation, were turned over to cotton. Much of this was produced for export to the West, to the fustian factories of northern Europe, with the Genoese and Venetians acting, as usual, as intermediaries. The Ottoman Empire's major industry was cotton production – growing, spinning and weaving – both for internal consumption and for export. This flourishing industry began to suffer setbacks in the 1650's, when Indian calicoes began flooding into the Levant; it eventually succumbed, in the 19th century, to cheap European cotton goods made from American cotton.

Cotton did not have to be taken to the New World; it already grew there, and is one of the very few plants that may have been brought to America from Asia in remote antiquity. Columbus was offered balls of cotton thread by the Indians of the Bahamas and of Cuba on his first voyage, and he noted that the Indians knew how to weave it. When the placer gold that had kept the hopes of the first colonists in Hispaniola alive gave out, as it quickly did, new sources of income had to be found. Illegal slaving, disease and forced labor had greatly reduced the indigenous population. When King Ferdinand died in 1516, Cardinal Cisneros, regent of Spain, sent a representative named Zuazo to report on the island. Zuazo recommended cotton and sugar cultivation – even designing an early cotton gin – and by 1570 cotton from the West Indies and Brazil was appearing in German markets.

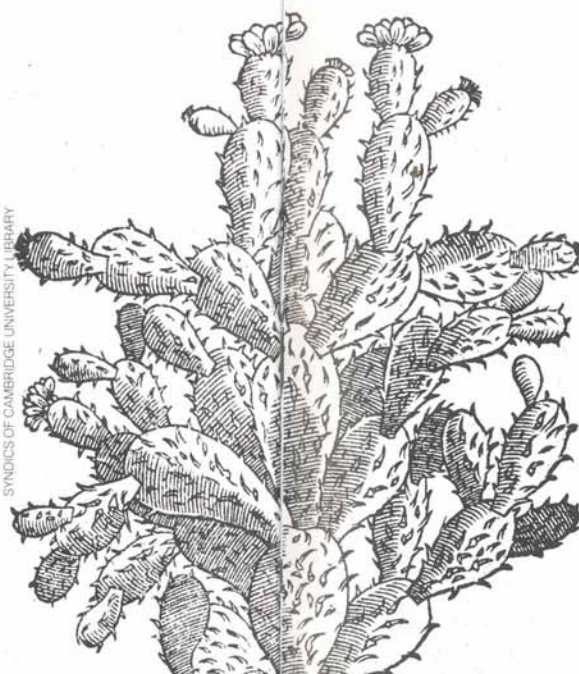
Silk production was underway in Central America, then called New Spain, by the 1550's. Here the native population had a long tradition of weaving and dyeing, and the cloth produced was comparable to the best Europe could offer. Indigo and cochineal were being produced here in the 17th century, both extremely valuable cash crops and both formerly produced in Muslim lands and traded to the West.

Indigo is a blue dye obtained from the leaves of *Indigofera tinctoria*; as its name indicates, the plant originated in India. It was grown in a number of places in Muslim lands, particularly Khuzistan, Egypt and Morocco's Sous valley. Indigo, unlike most natural dyes, does not require a mordant, or fixing chemical, which made it all the more valuable. It was widely counterfeited in the Middle Ages, and merchant's handbooks give elaborate instructions on how to test for "true blue."



Above, slaves at work on a sugar plantation on Antigua. The windmill in the background is another example of a Middle Eastern technological innovation that came to the New World by way of Spain.

Below, the nopal, or prickly pear, was the host in Central America to the insect from which the valuable dyestuff cochineal was obtained. This illustration is from Tabernaemontanus's *Neuw Kreuterbuch* of 1591.



Elias ibn Hanna, the Arab traveler, noted indigo cultivation in San Salvador in the late 17th century: "Everyone has a plot on which he grows indigo. It is as tall as wheat and some years grows to the height of a man. At that time it had become cheap in Mexico. When harvest time comes they gather it and throw it in a large trough, heat it and boil it down. In the trough are wheels which churn the water. Then they empty it into another trough and three days later it is ready. Then they form the paste into balls with their hands and spread it out in the sun. This is what they call 'curd indigo' in our country; from what is left at the bottom they make 'sheet' indigo."

In the Old World, a brilliant color-fast red dye was produced from an insect (*Coccus cacti*) which breeds on the grasses *Aeluropus litoralis* and *Aeluropus leavis*. The female insects were gathered, dried, crushed and used as a dye, which had to be fixed with a mordant. This was the true cochineal; it was only produced in Armenia and northern Persia, and was extremely expensive. A less brilliant and cheaper red was obtained from another insect, *Kermococcus vermilio*, a parasite of the kermes oak. Again, the dye was produced from the female insect and the color was fast. The second sort, "false cochineal," was produced in the province of Seville and near the city of Valencia in Arab times.

In the New World, cochineal was first cultivated commercially in the region of Oaxaca. Here was a

different insect, *Dactylopius coccus*, and a different host, the nopal, a species of cactus of the *Opuntia* genus, very similar to *Opuntia indica*, the so-called Barbary fig or prickly pear. This dye was produced in Mexico in pre-Columbian times, when it was known as *nochezli*, but under the Spanish its production was commercialized and it rapidly became a valuable export to Europe, with Seville the great cochineal market for the European textile industry. This is a fascinating example of how an ancient staple of the eastern luxury trade was replaced by a New World substitute.

Sugar was the earliest cash crop grown in the New World. Columbus brought sugarcane to the West Indies on his second voyage, as well as other Old World plants, in order to see how they would thrive in the new environment. Lettuce didn't do very well, but the sugar germinated in only seven days. Obviously Columbus was thinking of the prosperous sugar plantations on the Atlantic islands, and it has even been suggested that it was the search for new "sugar islands" that led to Atlantic exploration in the first place. This is probably an exaggeration, but the importance of sugar in the 15th and 16th centuries was great and growing; sugar was still a great luxury and very expensive.

The extensive sugar plantations of Andalusia, especially around Motril, had been particularly productive in the 14th and 15th centuries, but with the fall of Granada and the emigration of the Muslims, production had declined. So did Mamluk sugar production as the 15th century drew to a close. The Genoese-financed plantations in the Canaries and Madeira thus had a ready market. The earliest producer was the Canaries, and the system of plantations, irrigation, mills, refineries and slave labor elaborated there provided the prototype for the West Indies' sugar industry in the early 16th century.

Zuazo introduced sugar production to Hispaniola in 1517. Mills and refineries – *ingenios* – were set up with the help of experts brought from the Canaries; the technology was that developed over the centuries in Islamic lands. Hispaniola had a great advantage over Andalusia, the Maghrib and the Canaries in that there was plenty of fuel, which sugar-making required in quantity. Indeed, it is possible that one reason for the decline of sugar production in the Levant had been the deforestation that resulted from the fuel demand of the sugar vats. The problem of labor was solved in Hispaniola by importing black slaves from West Africa, sowing the seeds of a revulsion against sugar production that still today effectively proscribes the industry from certain Caribbean islands where it could be successful.

With the introduction of the sugar industry to the New World, another product that had traditionally been a virtual Muslim monopoly was now being produced in a new environment outside the Muslim world. In that sense, the New World was in effect being transformed into the Indies that Columbus had imagined that he found. ☉



Dangers
included
giants,
griffins,
Amazons

— and
leg-pulling
Indians.

Alexander the Great, at left, at the verge of death, dictates a letter to his mother in a painting from a manuscript in the Topkapı Palace Library. At right, a fabulous phoenix-like bird carries off its human prey in this miniature from the 1583 manuscript of the *Ta'rikh-i Hind-i Gharbi* in the Beyazit Library.

As Columbus threaded his way through the islands of the Caribbean, he was alert for giants, griffins, men with tails, huge snakes, dog-headed men and Amazons.

Those were all features of the mythical geography of Asia, with which he was familiar from reading Marco Polo and the fables of Sir John Mandeville. The presence of such phenomena would show Columbus that he was on the right course for Cipangu — Marco Polo's name for Japan — “where the palace of the emperor is roofed with sheets of gold the way we roof our churches with lead, and the walls of the rooms are plated in gold two fingers thick...”

Columbus himself did not discover the giants. That was left to his compatriot Amerigo Vespucci in 1499, who discovered giant footprints on the Isla de los Gigantes, modern Curaçao. Giants were associated in the classical authors with pearls, and indeed, it was not far from Curaçao that the Spaniards did first find abundant pearls. The “giant's bones” so bravely investigated by Arab traveler Elias ibn Hanna al-Mawsili in the cave near Santa Elena, in present-day Ecuador, are perhaps the last echo of this early obsession. (See “The New World Through Arab Eyes” in this issue.)

Griffins were first sighted in the interior of Cuba in 1494, although also not by the embassy which Columbus sent there to the emperor of Japan. Rumors of men with tails and of dog-headed men were rife, and on November 4, 1492, Columbus heard of men with the muzzles of dogs who ate human flesh; these were later identified with the Carib Indians. Dog-headed men were a feature of the Land of Darkness through which, in the Arab legend, Alexander the Great traveled in his search for the water that would give him immortality.

According to that legend, Alexander set off on his journey to the farthest West, into the Land of Darkness, shortly after marrying the queen of the Amazons in al-Andalus. Others, among them the Arab geographer al-Idrisi, located the Amazons on an island in the Atlantic. “In the Sea of Darkness are many islands,” says al-Idrisi,

... many uninhabited, others inhabited. Among the inhabited islands are the two islands of the fire-worshipping Amazons. The westernmost island is inhabited by men only; there are no women at all. The second island is inhabited only by women; not a single man lives there. Every year the men cross the passage between the two islands in their boats in the springtime. Every man seeks out a woman.... They stay about a month, then the men return to their island until the next year.... This is a long-established custom among them.

Columbus first heard of this island on January 6, 1493, just as he was about to sail back to Spain: “At a certain time of the year,” he wrote, “men from the island of Carib come to the women of this island, which is said to stand ten or twelve leagues away. If the women have a male child, they send it to the island of the men; if the child is a girl, the women keep the child with them.” Eight days later, Columbus learned that the island was called Matinino, present-day Martinique. He very much wanted to land and capture some of the Amazons as a gift for the King of Spain, but his ships were leaking and he decided instead to sail directly home.

Behind the legendary form in which references to Amazons are cast in Columbus's journal, and in other contemporary writings, there was a reality. The women of the Carib Indians fought alongside their men, and it was in the Caribbean that the Spanish explorers first came into contact with matriarchal societies — societies they were ill-equipped to understand. As more was discovered about the islands, the myth of the Amazons was displaced to other regions, until today it survives only as the name of the great Brazilian river, so-called by the Spanish explorer Francisco de Orellana because of the fierce Tupaya women he encountered there.

Always in the back of Columbus's mind was the idea that he was not far from the Earthly Paradise, which his reading had indicated was to be found near Cipangu. It was not until his second voyage that he discovered its whereabouts, but from the moment he landed at Guanahani, his journal makes clear that he thought he had reached a land of eternal spring and perhaps eternal youth.



As he did throughout his voyages – and like many explorers since, even in our own times – Columbus fitted what he found into the structure of beliefs he brought with him, interpreting and even describing the New World in terms of the legends of the old.

Thus he describes the natives of Guanahani, his first landfall: "They go naked as the day their mothers bore them.... None of them is more than 30 years old, very well made, with handsome bodies and good faces...." Two days later, on October 13, 1492, he again stresses in his journal the youth of the Indians: "As soon as day broke, there came to shore many of these men, all youths, as I have said, and all of a good height, very handsome people. Their hair is not curly, but loose and coarse as the hair of a horse; all have very broad foreheads and heads, more so than any people I have ever seen. Their eyes are big and pretty.... Their legs are very straight.... They have no paunches, but very good figures."

Thirty, or some said 33 – Alexander's age when he died – was the ideal age of man. This emphasis on the Indians' youth, coupled with the imagery of spring so characteristic of the early pages of Columbus's journal – "Near the said islet, moreover, there are the loveliest groups of trees I have ever seen, all green and with leaves like those of Castile in the month of April and May...." – make it clear that Columbus hoped – possibly believed – he had reached a land where no one grew old and where springtime reigned eternal.

Several late medieval maps mark an island in the Atlantic called "The Island of Jove" with the inscription, "Here nobody dies." Columbus and his brother Bartholomew were both cartographers, and at various times in their lives had made a living copying and selling maps. They were almost certainly familiar with the "Insula Jovis."

But it was not until the mainland of North America was discovered in 1513 that the legend of the Fountain of Youth took shape and astonished the Spanish court. Although the peninsula of Florida is clearly marked on the Juan de la Cosa map of 1502, perhaps indicating early voyages of which we know nothing, it was not until Juan Ponce de León received royal permission in 1513 to seek the legendary island of Bimini that the

mainland of North America was officially discovered.

Like Columbus before him, Ponce de León was not aware that he had discovered the mainland. He called the northern part of the peninsula – which he thought was an island – Florida, allegedly because he discovered it on Easter Sunday, or *Pascua florida*, as it was called in Andalusia. The southern part, also thought to be an island, he called Bimini, a name now applied to a very different place, in the Bahamas.

Peter Martyr d'Anghiera, the Italian-born historian to whom we owe so much of our knowledge of the early Spanish discoveries, was a learned and skeptical man. He first mentions the Fountain of Youth in the tenth letter of his second *Decade*, just after describing the voyage of Juan Díaz de Solís. Among the new lands he found, "at the distance of 325 leagues from Hispaniola, those who have explored the interior say there is an island which is called Boyuca or Ananeo,

Florida, discovered by Ponce de León in 1513, appears at the top of this chart of the Caribbean, part of the Juan Martínez Atlas of 1587, now in the Biblioteca Nacional in Madrid.

Juan Ponce de León, above, used the legend of the Fountain of Youth to win royal support for the exploration and colonization of Florida. His actual aim may have also been to secure a new source of Indian slaves.

where there is a fountain which has the virtue that by drinking its water, old men are rejuvenated." Somewhat later, this island was identified with the coast of Florida explored by Ponce de León.

Peter Martyr goes on to say that "all the people, and not a few men distinguished by virtue or fortune, hold this to be true," and that the news had been avidly received by the Spanish court.

Ponce de León may have encouraged the spread of the story of the existence of a Fountain of Youth in order to get royal permission to found a colony in Florida. What lent the story credence was that it was vouched for by a Lucayo Indian, who claimed his own father had gone to Florida as an old man, bathed in the magical waters and been rejuvenated. Peter Martyr met this Indian, who had been captured in a slave raid and taken to Spain, where he learned Spanish and where he was baptized Andres Barbudo – his last

region called Xapida, where pearls were found in abundance – as they almost always are where giants are to be found. These people had great herds of domesticated deer, which they milked. They also made deer-milk cheese.

There was another region on the mainland called Inzingnanin. Long ago a people arrived in this place by sea; they had inflexible tails, like crocodiles. In order to sit down comfortably, they used stools with a hole in the middle. If these were lacking, they made a hole in the earth the length of their tail, and thus could repose in comfort. They ate only raw fish, and because this was lacking in their new home, they quickly died out, leaving no issue.

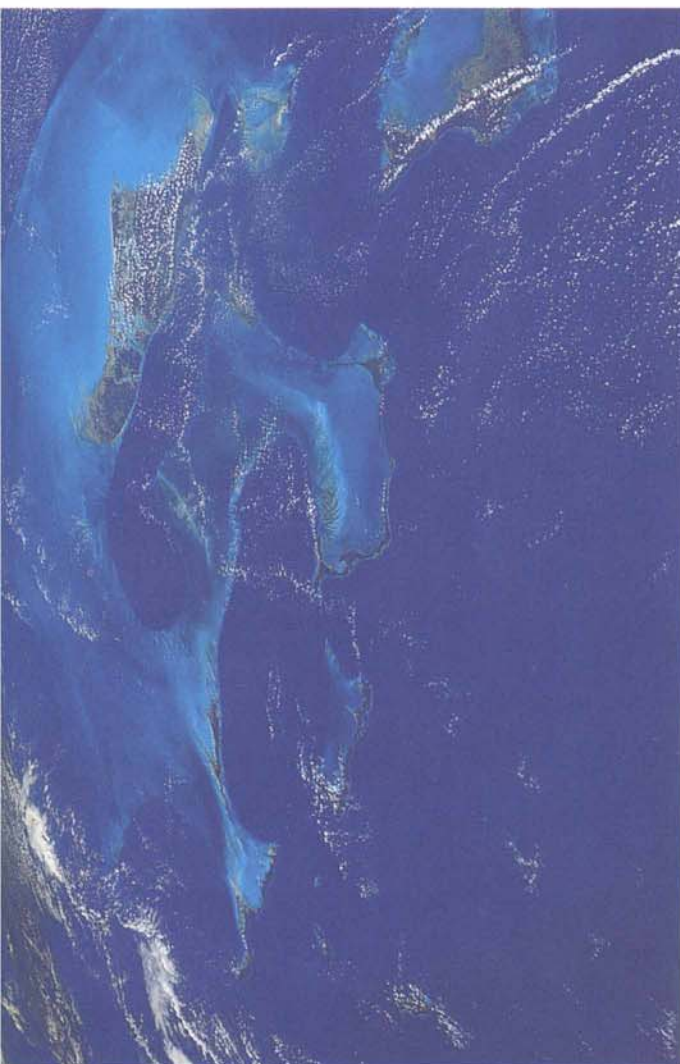
In the province of Duhare, Chicorano said, everyone was the same age, for the old were continually rejuvenated – presumably by drinking the waters of the Fountain of Youth.



El Adelantado IUAN PONCE Des-
cubridor de la Florida.

HISTORICAL MUSEUM OF SOUTHERN FLORIDA

It is obvious that Francisco Chicorano and Andres Barbudo were having a great deal of fun at the expense of the Spaniards. It is also possible, however, that men like Vázquez de Ayllón were not as gullible as they might appear. These stories were calculated to awaken official interest in the mainland, until then unexplored. Vázquez de Ayllón wished to found a colony there – and he evidently had another, secret, purpose as well.



By 1513, the year Ponce de León discovered Florida, the Lucayo Indians were virtually extinct and their islands, the Bahamas, uninhabited. Between 1509 and 1513, 40,000 Lucayos had been transported to work in the mines and sugar plantations; most had died. It was not the search for the Fountain of Youth that drove Ponce de León to Florida, but the labor shortage resulting from the extermination of the Lucayos, which he intended to alleviate by illegal raiding for slaves. Rumors of a Fountain of Youth were instrumental in gaining royal approval to explore and settle the mainland.

Although there are classical legends of an island of eternal youth, the principal – perhaps only – source of the legend of a fountain of youth is the Oriental romance of Alexander the Great, particularly the Arabic version of the story of al-Iskandar Dhu al-Qarnain, “Alexander the Two-Horned.” Alexander is referred to in the Qur’an by the epithet “Dhu al-Qarnain” because he traveled to the two ends, or “horns,” of the earth – or possibly because of two locks of hair that hung to his shoulders. We have already seen how the legend of the islands of the Amazons is derived from this romance.

In the Arabic Alexander romance, Alexander sets off for the Land of Darkness to find the “Well of Life,” as it is called in Arabic, because he has learned that his allotted span is almost up and he wishes to prolong his life. In some versions, he is accompanied by his cook – named Andreas in the Syriac version, Idris in the Arabic – or by a mysterious figure named al-Khadir. Al-Khadir means “Ever Green”; *floridus* would be a good Latin translation. Alexander’s companion unexpectedly finds the Well of Life when a dried fish he soaks in it suddenly comes to life and swims away. He bathes in the spring, and then runs to tell his master. Both men return, but they are unable to find the magical spring again. The cook is immortal, and Alexander must die.

This episode from the immensely long Arabic romance was, and is still, well-known throughout the Islamic world; there are versions of it in languages as widely separated as Mongolian and Javanese. The European versions of the legend were equally popular in the European Middle Ages – but only the Oriental versions contain the episode of the Well of Life.

The story of Alexander was popularized in the Islamic world both by poets of the stature of Firdawsi and Nizami, in elaborate Persian poems, and in less pretentious versions in simple Arabic prose. Two of these prose versions are known from Spain, one in Arabic and one *aljamiado*, that is, in a form of Spanish written in the Arabic alphabet.

The story must have been of particular interest in Islamic Spain because so much of its action was set “in the farthest West” – Spain’s position in relation to the Muslim world. It undoubtedly penetrated Andalusian folklore, as did so many other Oriental tales, and in fact it is probably from Spaniards in the New World that the Indians Francisco Chicorano and Andres Barbudo first heard of the “Fountain of Youth” – and of giants and men with tails. These stories were in their turn believed by the Spaniards, because they fitted into a pre-existing mythical framework.

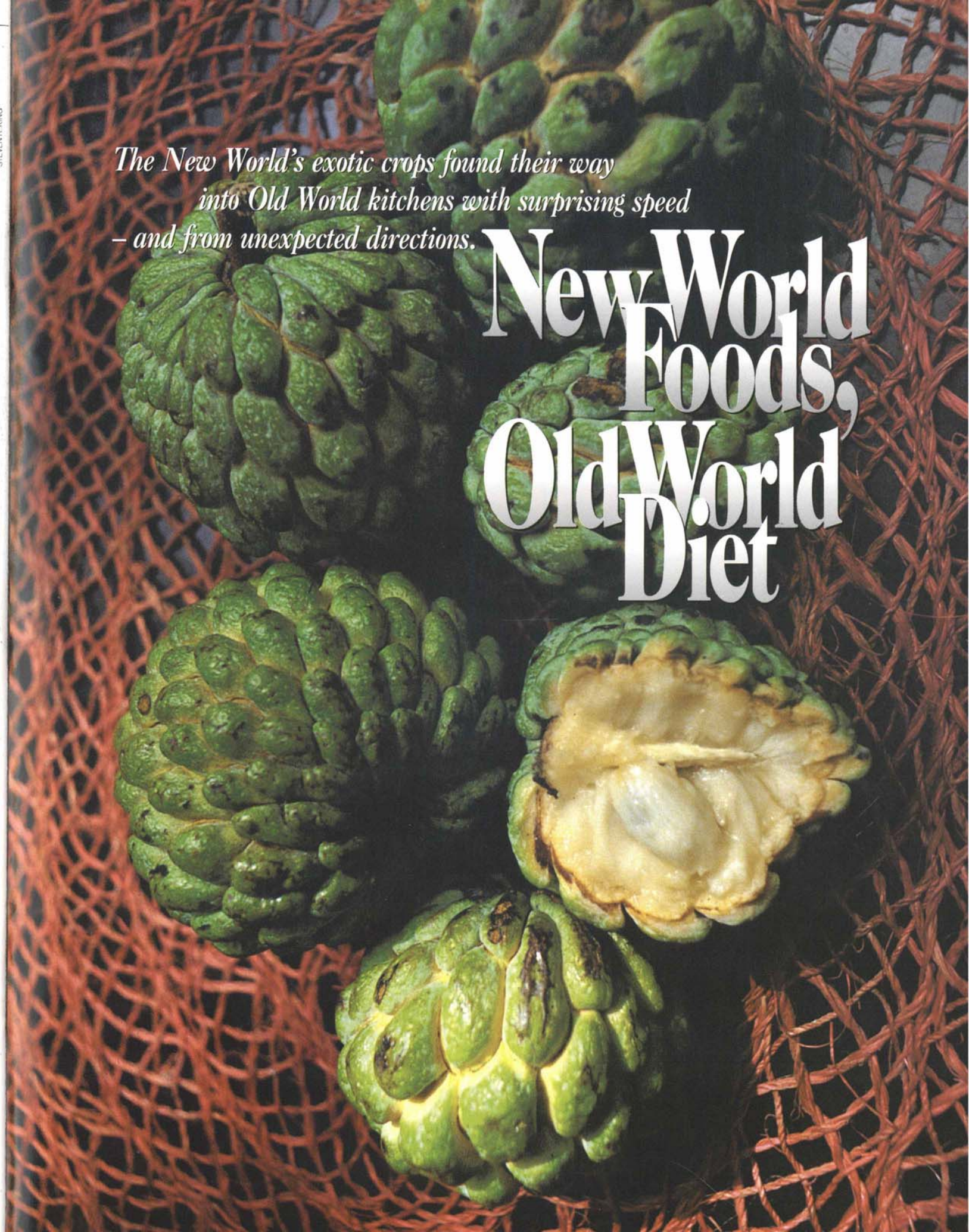
In succeeding years, the Spaniards’ closer contact with the natives of Florida does not seem to have turned up any further legends of giant kings, men with tails or the Fountain of Youth. This is because the stories were never indigenous to the Americas; rather, they were brought there by the Spanish conquerors themselves, who in turn had borrowed them from the Arabic Alexander romance. 🌐

The Bahamas, at left, were virtually depopulated by 1513, due to the extermination of the Lucayo Indians. This view of the islands was taken by the crew of the space shuttle *Discovery*.

The New World’s exotic crops found their way into Old World kitchens with surprising speed – and from unexpected directions.

New World Foods, Old World Diet

STEVEN R. KING



Caribana

Consider the custard apple. It is a favorite fruit in India, where it is known as *sitaphal*, "the fruit of Sita," or, by a borrowing from Arabic, as *sharifa*, "the noble." The custard apple, *Annona reticulata*, is so integrated into the Indian diet that it is the subject of legends, paired with another of the Annonaceae, the sweetsop or sugar apple (*Annona squamosa*), called "the fruit of Rama," *ramaphal*. Nineteenth-century travelers in India remarked that the custard apple grew wild, abundantly, in the jungles of the Deccan. The Carmelite Vincenzo Maria, whose book on the East Indies was published in Rome in 1672, gives a good description of the plant and its fruit, which he knew by its Malabari name: "The plant of the *Atta* in four or five years comes to its greatest size The fruit ... under the rind is divided into so many wedges, corresponding to the external compartments. ... The pulp is very white, tender and delicate, and so delicious that it unites to an agreeable sweetness a most delightful fragrance like rose-water ... and if presented to one unacquainted with it he would certainly take it for bla[n]c[m]ange."

Custard apples and sweetsops grow in the Philippines, Malaysia and China as well as India. The custard apple is eaten with relish in Lebanon, where it is known as the "Indian quince." In Andalusia, a related fruit is the *chirimoya*, a Quechua Indian name – for this fruit, like the custard apple and the sweetsop, is of American origin. All three were brought from the New World to the Far East in the late 16th or early 17th centuries by two routes and two nations: by the Portuguese westward around the Cape of Good Hope and, after 1575, by the Spanish from Acapulco via Manila.

Evidence for this double dissemination of the *Annona* is the fact that one of its names in Mexico is *até*, apparently the origin of the Tagalog and Malabar names, and that in Malaysia and Indonesia it is sometimes called *nona*, a recognizable version of the West Indian – and Latin – name for the fruit.

In the 16th and 17th centuries a number of American plants were thoroughly acclimatized in India and elsewhere in the Far and Middle East. The exact lines of transmission are usually unknown, though we know, for example, that the Moghul emperors at first received their pineapples through the Portuguese-controlled Indian ports. But who brought the custard apple, the guava and the cashew tree? By what route did they come, and to which ports? All three now grow wild in India.

The papaya is another New World plant that found its way to the Far East very early. In this case we know the route by which it was disseminated, thanks to the observant Dutch traveler Jan Huygen van Linschoten, who saw the papaya in India before 1596: "There is also a fruit that came out of the Spanish Indies, brought from beyond ye *Philippinas* or *Luzons* to *Malacca*, and from thence to *India* it is called *Papios* and is very like a *Mellon* ... and will not grow, but always two together, that is male and female ... and

when they are divided and set apart one from the other, then they yield no fruit at all This fruit at the first for the strangeness thereof was much esteemed, but now they account not of it."

The papaya, in other words, was brought to the Philippines by Spaniards, and from there to the Portuguese trading entrepôt of Malacca in Malaysia, and thence to India. By 1626 it had reached Nepal. So a fruit first noted by Columbus in the Caribbean and described by Spanish chronicler Fernández Oviedo y Valdés from a tree seen in the Isthmus of Panama in 1519, had reached India less than 100 years after its first discovery. The papaya is now so at home in the Far East that it requires an effort to remember that it originally came from the West, not the East, Indies.

In the Caribbean and Central America, one of the Amerindian uses of the papaya tree had been as a meat tenderizer. The leaves contain an enzyme called papain, which acts very like the digestive juices of the stomach, and is an ingredient of commercial meat tenderizers. But the leaves of the papaya tree do not seem to be used for this purpose in the Far East: Transplantation to a new environment in this case involved the loss of essential information about the species. This is only a single example of many: The agave, which also reached southern Europe and the Far East in the 16th century, had many uses for the inhabitants of Mexico; in Europe and the Far East it seems to have been planted solely as decoration, and it is only in East Africa that it is grown for sisal. The nopal or prickly pear (*Opuntia* spp.) is used in North Africa, Andalusia and India mainly as hedging, although the fruit, the Barbary fig, is eaten. In Mexico, the plant had many more uses, and the leaves, stripped of their thorns, are still eaten today in several forms. Yet outside the plant's original New World habitat, they never seem to have been so used, even in times of famine. Another example of lost information is the prickly poppy, *Argemone mexicana*: Although considered a weed in India, it was cultivated in pre-Columbian Mexico as an important source of medicinal drugs.

The Carib Indians grew pineapples in their gardens; on the mainland the fruit was first noted in Panama. The pineapple traveled east very rapidly, perhaps because it traveled so well: Its long "shelf life" made it an ideal fruit to carry on board the galleons. It brought one of its indigenous names with it: Except in Spanish, English, and Italian, the pineapple is the *ananas* – or some recognizable version of this word – in European as well as in Asian languages, including in Arabic.

The first certain mention of the pineapple in India occurs in the year 1590. Abu al-Fazl describes it in his wonderful statistical description of the Moghul Empire, the *Ain-i Akbari*: "Pine-apples are also called *kathal-i safari*, or traveling jackfruits, because young plants, put into a vessel, may be taken on travels and will yield fruits. In color and shape they resemble an oblong orange: The leaves have the shape of a hand. The edges of the leaves are like a saw. The fruit forms



Previous page: Custard apples from Indonesia, where they are called *buah nona*. *Nona* was one of the Amerindian names for the fruit, which may have reached Java and Indonesia as early as the 16th century. At left, a pumpkin drawn for a 16th-century Chinese botanical encyclopedia, the *Pen Tsao Kang Mu*.

Above, the earliest Chinese representation of maize, from the *Pen Tsao Kang Mu*, which was reproduced by Bonafous in his 1823 monograph to prove that maize was of Old World origin. At right, Mansur's painting of a turkey, made at the request of Moghul emperor Jehangir in 1612.

at the end of the stalk and has a few leaves on its top. When the fruit is plucked, they cut out these leaves, separate them, and put them singly into the ground; they are the seedlings. Each plant bears only once, and one fruit only."

Akbar's son, Jehangir, was – like his father and his grandfather Babur, founder of the Moghul dynasty – very interested in plants and gardening. His memoirs, the *Tuzuk-i Jehangiri*, mention a number of fruits that became common in India during his father's reign. Since Akbar ruled India from 1556 to 1605, this gives us at least a rough time frame for the introduction of those New World plants to the Indian subcontinent. One of these was the pineapple: "Among fruits, one which they call *ananas*, which is grown in the Frankish ports, is of great fragrance and excellent flavor." Muslim writers normally called Europeans, whatever their origins, "Franks"; here, Jehangir is referring to the Portuguese, who controlled a number of ports on the west coast of India.

One of these ports was Goa, and it was from there that Jehangir, following in his father's footsteps, obtained another New World exotic – a turkey. On April 4, 1612, Jehangir received one of his chief retainers, a man named Muqarrab Khan, whom he had sent to Goa.

When he returned from the aforesaid port to the Court, he produced before me one by one the things and rarities he had bought. Among these were some animals that were very strange and wonderful, such as I have never seen, and up to this time no one had known their names. Although King Babur has described in his Memoirs the appearance and shapes of several animals, he had never ordered the painters to make pictures of them. As these animals appeared to me to be very strange, I both described them and ordered that painters should draw them in the *Jehangir-nama*, so that the amazement that arose from hearing of them might be increased. One of these animals in body is larger than a peahen and smaller than a peacock. When it is in heat and displays itself, it spreads out its feathers like the peacock and dances about. Its beak and legs are like those of a cock. Its head and neck and the part under the throat are every minute of a different color. When it is in heat it is quite red – one might say it had adorned itself with red coral – and after a while it becomes white in the same places, and looks like

cotton. It sometimes looks of a turquoise color. Like a chameleon it constantly changes color. Two pieces of flesh it has on its head look like the comb of a cock. ... Round its eyes it is always of a turquoise color, and does not change. Its feathers appear to be of various colors, differing from the colors of the peacock's feathers.

The wonderful painting of Jehangir's turkey fortunately survives; it is by the court painter Mansur, who was particularly adept at painting birds, and it is one of the very few surviving Islamic depictions of a New World exotic.

The turkey spread rapidly in India, where it was known as *piru*, perhaps from the name of the South American country. The men and women who celebrated the first Thanksgiving Day in 1621 were thus anticipated in their enjoyment of the turkey by the Moghul court in India. The turkey had reached Europe still earlier, of course; it is one of the few New World products to be instantly accepted by Europeans, who were eating turkey by the late 1540's.

Three years after Mansur painted Jehangir's turkey, the English ambassador to the Moghul court was served a magnificent feast. There were of course numerous rice dishes and curries, but the guests were also served "potatoes excellently well dressed." These were almost certainly sweet potatoes rather than white potatoes, for the sweet potato, like the pineapple, spread

very quickly in the East. The white potato does not seem to have become popular before the 18th century, when it suddenly spread throughout the world, its virtues as a staple against famine finally recognized. Both came from the New World. The sweet potato was encountered early, for it was a staple food in Haiti. The "white" potato was a native of Peru, where it had been cultivated in a bewildering number of varieties – and colors – for millennia. The two are not related; the sweet potato is a member of the order Convolvulaceae, while the white potato is one of the Solanaceae, like the tomato and the capsicum pepper.

The sweet potato is one of the few American plants that may have been carried across the Pacific in pre-Columbian times. Antonio Pigafetta, chronicler of the Magellan voyage – and incidentally a man who prob-



Austen Henry Layard belonged to the heroic age of archaeology. His astonishing discoveries in Mesopotamia laid the foundations of modern Assyriology and radically changed our perception of the ancient world. In his classic *Nineveh and Babylon*, published in 1858, he describes one of the Assyrian stone reliefs he discovered at Koyunluk: "The walls were panelled with sculptured slabs about six feet [two meters] high. Those to the right, in descending, represented a procession of servants carrying fruit, flowers, game and supplies for a banquet, preceded by mace-bearers. The first servant following the guard bore an object which I should not hesitate to identify with the pineapple, unless there were every reason to believe that the Assyrians were unacquainted with that fruit. The leaves sprouting from the top proved that it was not the cone of a pine tree or fir. After all, the sacred symbol held by the winged figures in the Assyrian sculptures, may be the same fruit, and not, as I have conjectured, that of a coniferous tree."

Layard's great contemporary Sir Henry Rawlinson, the leading authority of the time on ancient Near Eastern history, was not so hesitant, and was convinced that the fruit in the frieze at Koyunluk, and which appeared elsewhere in Assyrian sculpture, was indeed the pineapple.

Rawlinson may not have realized the implications of this identification. There are only two possibilities: Either the pineapple was indigenous to both the Old World and the New, or it was brought to the Old World from the New. Yet, despite claims that it has been found painted on Egyptian pottery and even depicted in a Roman mural at Pompeii, nothing like the pineapple is mentioned in the ancient literatures of the East, nor in the whole body of Roman and Greek literature.

That fact, though negative, is pretty conclusive evidence that the pineapple was unknown to antiquity.

Since the pineapple is a very tough plant and spreads with rapidity, it is also unlikely that, once introduced, it would then vanish from cultivation. The fruit being carried in the Assyrian friezes is almost certainly not the pineapple, but a germinating date palm, a symbol of fertility.

Major General Cunningham, of the Archaeological Survey of India, working at the site of Bharhut in south India last century, was convinced that some of the stone figures he excavated there were holding custard apples, *Annona reticulata*. These are also said to be depicted on some of the frescoes at Ajanta. Here again is an identification from an iconographic representation. The statues from Bharhut are clearly pre-Columbian in date; if the fruit depicted is the custard apple, it is evidence of contacts between the New World and the Old – in this case trans-Pacific contacts – in pre-Columbian times.

The problem is complicated by the fact that at least two American plants do seem to have crossed the Pacific before Columbus crossed the Atlantic. One of these is the sweet potato, apparently known in Polynesia in pre-Columbian times. The other is cotton, the diploid variety of which is found in both Old World and New, and may have been taken to the New World very early.

At least two Old World plants were found already growing in the New by the Spanish when they arrived. One was the coconut palm, the other sugar cane. Several early Spanish chronicles mention the coconut palm growing on the west coast of Panama. Had it been brought by man, or carried

there by the sea? A kind of cane very like sugar cane was found growing on the coast of Brazil. Was it sugar cane, which has no wild ancestors in the Old World? These questions are very difficult to answer, especially given the speed with which Old World plants acclimatized in the New. The classic example of this phenomenon is the peach, which spread in North America more rapidly than the advance of *Homo europæus*: It had become standard fare for a number of North American Indian tribes long before they had any direct contact with Europeans. Old World weeds and wildflowers also spread very rapidly, outdistancing the *conquistadores*.

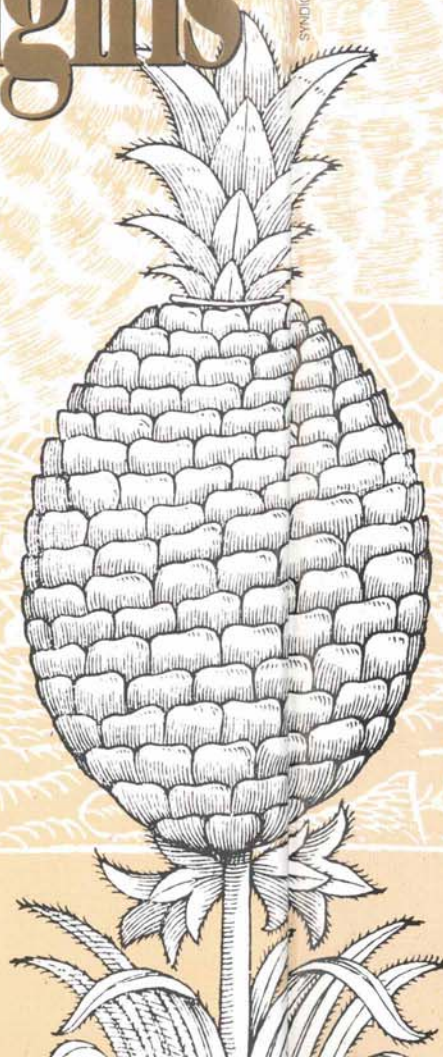
We have already seen how the New World origin of the haricot bean has periodically been questioned. Dictionaries give two possible etymologies for the word "haricot" – one Old French, the other Aztec. The fact that what we call the lima bean – it has lost both its capital letter and its Spanish vowel in English – is known in some parts of Asia as the Rangoon bean shows how fluid the name of a plant can be and what a poor guide it may be to the plant's place of origin. Theoretically, iconographic representations of plants should be much less subject to argument. But this is not so: Where some see pineapples, others see pine cones.

Questionable Origins

Even the American origin of the turkey has sometimes been challenged, not only on the basis of its odd English name, but because of claims that it appears on the border of the Bayeux Tapestry – which was supposedly created about the year 1100. I have examined a good color reproduction of the Bayeux Tapestry and found many birds, but nothing quite like a turkey. On the other hand, the doubts recently cast on the date of the Bayeux Tapestry by Robert Chenciner, who cites the scenes of the Norman soldiery devouring shish kebab as evidence that the tapestry we have is a later copy of the original, means that anything is possible. A turkey in the tapestry might tell us less about medieval contacts with the Americas than about the date of the Bayeux Tapestry itself!

Columbus found the natives of Cuba smoking loosely-rolled tobacco leaves, the prototype of the cigar. Oddly, tobacco seems to have spread less swiftly than maize – oddly, because mankind has always been quick to accept new drugs. It was brought under cultivation in Spain in 1558, and after that there was no stopping the spread of tobacco. We have seen how it reached Fez in 1599; its progress through the Middle and Far East can be almost exactly dated by the publication of prohibitions against its consumption. Japan forbade the use of tobacco in 1607, the Ottoman Empire in 1611. The Moguls forbade it in 1617. Everywhere its use gave rise to violent polemics, as did the use of chocolate at a slightly later date. This American plant conquered the world; it was smoked, chewed and sniffed everywhere from Spain to China.

The French scholar Belon, who believed turkeys were known in the Old World, illustrated them (background) in his *Histoire naturelle*. Oviedo illustrated the pineapple (below) in the *Coronica de las Indias* in 1547.



Oviedo says the word *tabaco* was applied by the Indians of Hispaniola to the Y-shaped pipe used to smoke the herb. Las Casas, whose familiarity with the islands was unrivaled, says it is the name of the leaf itself. This implies that both the plant and its name are of American origin.

Or are they? Wiener, in his *Africa and the Discovery of America*, published in the 1920's, thought tobacco may have originated in Africa; others have occasionally suggested the same. Yet this is certainly mistaken; if tobacco had been grown and smoked, chewed or sniffed in pre-Columbian Africa, at least in the areas familiar to the Arabs, they would certainly have mentioned it. The disagreement about the meaning of the word "tobacco" itself may be because the same word meant different things in different Indian languages or dialects, but in any case it shows that there was a certain amount of confusion about the name of the herb even when it was first encountered on its home ground.

The early 19th century Tunisian scholar and traveler Muhammad ibn 'Umar ibn Sulayman al-Tunsi visited Dar Fur, in the Sudan, in 1803 – long before this remote and interesting region had been visited by Europeans. In his fascinating account of the Sultanate of Dar Fur, entitled *Tashhidh al-Adhan bi-Sirat Bilad al-'Arab wa-l-Sudan*, he mentions the various food plants – among them maize – grown in Dar Fur. In the little market of Kusa he saw tobacco for sale. Now the word for tobacco in Arabic is generally *dukhkhan*, meaning simply "smoke." But in Kusa, it was known as *taba*, and al-Tunsi was struck by this word's resemblance to the French *tabac*. Here is exactly what al-Tunsi says: "They were selling tobacco [*dukhkhan*] in the market of Kusa, but they call it *taba* in their language, like the French. This coincidence is surprising. Not only do the people of Dar Fur call tobacco *taba*, but indeed, it is so-called throughout the Sudan. The people of the Fezzan and Tripoli call it *tabgh*."

Al-Tunsi then quotes a number of lines from a poem which he believed to have been composed about the year 1450. The poem is a defence of *tabgha* smoking, indeed, the second verse literally spells it out:

"Almighty God has caused a plant to appear
in our land which is called, without any doubt,
tabgha / Spelled ta, b, gh, a."

Since the word occurs in the form *tabgha*, al-Tunsi presumably saw the poem in Fezzan or Tripoli. Modern Arabic dictionaries give the word in the form *tabgh*, but it is not common in the spoken language. If al-Tunsi is right about the date of the poem, *tabgha* must have been some plant other than tobacco. A more likely explanation, however, is that the poem is later than Al-Tunsi thought, and that *tabgha* is a deformation of French *tabac* or Spanish *tabaco*, although one would expect a form more like *tabak*.

The *taba* of the Sudan was made of the green leaves of tobacco plants, pounded in a wooden mortar, formed into little pyramids and dried in the sun. It was very strong, and al-Tunsi says one almost fainted at the smell. Is it possible that before the introduction of tobacco, *taba* was made of some other leaf, and the old name was then applied to the new substance? Did this word *taba* then reach North Africa in the form *tabga*, and was it then used in Spain for the American herb?

ably passed the latter part of his life in Ottoman service – ate sweet potatoes in Brazil. He noted them again in the Ladrões, in mid-Pacific. It has been claimed that he confused the sweet potato with the yam; this seems unlikely for one who had eaten both. The widely spread name for the sweet potato in the Pacific – *kumara* – is claimed as additional proof of its pre-Columbian trans-Pacific dissemination, for it is said that *cumar* was the indigenous name for the sweet potato in Peru.

The tomato is a peculiarly elusive fruit. It was known – and grown – in Europe in the 16th century, but was it eaten? The family Solanaceae contains many poisonous plants, deadly nightshade and henbane among them, and pre-Linnean botanists may have been aware of this. Popular resistance to the tomato – and initially the potato – may have been due to the poisonous leaves of the former and the potato's poisonous flower. It is only in 1608, in Seville, that there is a record of the tomato being eaten. This may be due to the closer contact the Andalusians had with Amerindian cultures: They would have known that the Indians ate tomatoes and didn't die.

The tomato originated in Peru or Mexico and was among the plants brought back to Spain, and thence to Naples, a Spanish dominion after 1522. The first tomatoes were probably lobed and yellow to golden in color – hence the Italian name *pomodoro*, "golden apple"; this type can still be found in Andalusian vegetable gardens today. The Italians, like the rest of Europe and America, probably did not eat these tomatoes raw before the late 19th or even 20th century, however. Believing them to be poisonous, they boiled them into a sauce – which begs the question: What did they put on pasta before this great invention?

It is very difficult to imagine Italian food without the tomato, and the same is true of North African and Near Eastern food. When and how did this New World fruit reach the Middle East? A tomato is called *banadura* in colloquial Arabic throughout the Middle East, though not in Morocco, and this is obviously a version of the Italian name, so it is probable that they received it via Italy. As to when: For the 'Alawites of Syria tomatoes and pumpkins – both New World products – are forbidden foods, but such prohibitions, which obviously came into being only after the foods themselves were known, are themselves difficult to date. Tomatoes, along with other New World cultigens like pumpkins, kidney beans and maize, were being eaten in Algeria in the mid-18th century, for they were observed there by the English scholar and traveler Thomas Shaw.

The Islamic world generally seems to have been more open to the new foods than was Europe, perhaps because of a longer tradition of experimentation with new cultigens. Muslims either ruled or formed substantial majorities in lands stretching from the Atlantic coasts of Africa and Spain all the way to the Philippines, it is no wonder that they tended to be more experimental in what they grew and ate than



SYNDICS OF CAMBRIDGE UNIVERSITY LIBRARY

the later Middle Ages: Improved diet, broadly speaking, brings improved productivity. More research needs to be done on the history of the haricot bean, but as we shall see, it is not the only New World plant whose origins have been questioned.

The chili pepper – one of dozens of varieties of capscums, ranging from the mildness of bell peppers to the fire of habañeros – is used as a seasoning from Morocco to the Philippines. Columbus encountered it in the Caribbean, where it was called *aji*. It was brought to Spain in 1514, but except in *chorizos* is hardly used in Spanish cooking. It reached India during the reign of Jehangir, in 1611, presumably brought by the Portuguese, and was diffused, like other New World products, from India and the Philippines throughout Southeast Asia. Yet the date of its arrival in the Middle East is unknown.

It is not easy to understand why some plants were thought worth mentioning in the written sources and others not. The properties of the chili pepper are surely remarkable enough to have elicited some comment, and it would be hard to imagine, say, Tunisian food without the fiery chili sauce called *harisa*. Yet no surviving documentary evidence of the plant's introduction exists. On the other hand, its use in the Middle East and North Africa is rather localized; it never obtained the wide acceptance there that it did in India, Malaysia and Thailand.

The peanut is a peculiar plant. Its flower bends down until it touches the earth and the fruit ripens underground. This makes the peanut plant easier to identify from early descriptions than some other New World plants, such as maize and the squashes. The Chinese scholar Huang Hsing-tsêng, who died in 1540, calls the peanut *lo-hua-sheng*, "born from flowers fallen to the ground." "After the flowers fall," he says, "the pods begin to develop underground." Huang says the peanut grew near Shanghai. Other early Chinese writers say the peanut entered China via Fukien, which is likely, as this maritime province was in contact with the Portuguese, who arrived in Canton in 1516.

The earliest Chinese reference to the peanut is dated 1538; the plant may have reached Malaysia even earlier. Now it is a staple in both Malaysia and Indonesia, to say nothing of West Africa, where the peanut probably also arrived earlier than in China. The Portuguese are believed to have brought the peanut to West Africa to provide cheap, nourishing food for slaves destined for the New World.

But the first American food plant to reach China was what Americans call corn and the rest of the English-speaking world knows as maize, one of the most important of world grains. With a yield per acre at least three times that of wheat, a short growing season and great tolerance of climatic variations, maize transformed lives wherever it was introduced, whether it was used as animal feed, human food or both. It arrived in China in 1513, only 19 years after

Illustrations of maize from (left) Bonafous's *Histoire naturelle, agricole et économique du maïs*, published in 1836 and long the standard work, (below) Fuchs's *De historia stirpium*, 1542, and (below right) Ramusio's *Navigazioni*, 1583.

Columbus found it growing in the Caribbean. A Chinese woodcut of a recognizable maize plant dates from 1590. The cob is much smaller than those of the flint or dent maizes with which we are familiar, and it is possible that this first introduction of maize to China was a dwarf variety, for these are still highly regarded in the Far East.

There is evidence that maize reached the Levant before the Ottoman conquest of Egypt in 1517: It was certainly grown in Egypt in the early years of the 16th century. It is said to have been planted as early as 1500 in Seville, although it is doubtful if a taste for maize caught on in Andalusia so early. Very early indeed, the Portuguese planted maize in the Cape Verde Islands – again to provide cheap food for slaves – although 1502, the date which is sometimes given, also seems unlikely. In 1574, the botanist Leonhart Rauwolf collected a specimen of maize from the banks of the Euphrates; that specimen still exists in the herbarium of Leiden University.

The word "maize" is probably Carib; chronicler Peter Martyr, to whom we owe an excellent early description of it, spells the word *maiz*; Giambattista Ramusio, in his famous collection of voyages, spells it *mahiz*. But 16th-century Europeans did not call it that. The Italians called it *granturco*, "Turkish grain"; in southern France it was "Turkish wheat". In West Africa, where it was introduced very early, the Hausa-speaking peoples called it *masar*, simply a variant of the Arabic word for Egypt, *misr*. The Turks called it *misir* too, which implies that they first encountered it in Egypt, or perhaps in Mamluk territory. The Arabs have always called it *dhurah*, in dialects *dura* or *dra*, followed by an adjective. *Dhurah* is Arabic for sorghum, but to distinguish maize from this other grain, maize was called "red sorghum" or "Abyssinian sorghum" or even "Indian sorghum"; in Egypt it was called "Syrian sorghum", and in Syria, "Egyptian sorghum."

It is most interesting that, in the countries most intimately concerned with the New World – Portugal, Spain and Italy – only Matthioli, in the 1570 edition of his herbal, ascribes a New World origin to maize. The learned community, like the people at large, thought it came from somewhere in the Ottoman Empire, as the names they gave it attest. Bonafous, who wrote an important monograph on maize as late as 1836, was still convinced of its Asiatic origin, and to support his argument printed a Chinese woodcut of the maize plant drawn from the 16th-century Chinese herbal, the *Pen Tsao Kang Mu*.

Yet there is no doubt that maize indeed originated in the New World, where it has been cultivated for millennia. Archeologists have found the wild ancestor of maize in very deep strata; its antiquity is proved by the wide number of varieties cultivated in the Americas. The Amerindians, as with the haricot bean, delighted in developing hundreds – even thousands – of different varieties of maize, selecting for size, texture, color and taste.

But Carl Sauer, the well-known American geog-

rapher who spent a lifetime studying New and Old World plant uses and distributions, noticed a curious passage in the *Decades* of Peter Martyr. Describing maize in his very first letter, soon after Columbus's return from his first voyage, the Italian-born chronicler says the Indians make their bread from "a certain floury grain which is found in abundance among the Insubres and the people of Granada." He compares the size of the kernels to peas, and says the grain is called *maiz*.

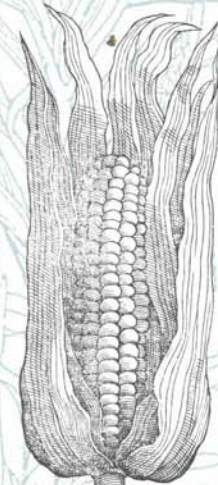
"Insubres" is merely a playfully learned term for the inhabitants of Milan, and the area of Milan is among the very few regions of Europe where maize is habitually eaten today, along with central Portugal, Galicia and the Balkans.

Peter Martyr says the grain is also grown around Granada, and there is another bit of evidence that this was so. Leo Africanus – his Arabic name was Hasan ibn Muhammad al-Wazzan al-Zaiyyati – left Granada when it fell to the Christians in 1492 and settled in Morocco. In about 1516, he was sent on a diplomatic mission to the Niger region. In his very detailed description of North and West Africa, published by Ramusio in his collection of voyages in 1563, Leo Africanus mentions an unnamed grain which he found growing in two places. Describing Walata, in what is now Mali, he says: "Little grain grows in this country, and this is millet and another kind of grain, round and white like chickpeas, which is not seen in Europe." To this passage Ramusio added a marginal note, saying this grain was called *mahiz* in the West Indies. Leo Africanus noted the same grain in Gubar, and in this passage says that he thinks it also grows in Spain.

It is possible, but unlikely, that maize had reached Mali from the west coast of Africa by 1516, but this would not account for Leo's statement that he thought the same grain grew in Spain – which he had last seen in 1492! Modern editions of Ramusio point out that the identification with maize is Ramusio's, not Leo's, and that what Leo probably saw was a variety of sorghum. But none of the many varieties of sorghum have grains the size of chickpeas....

Africanist M.D.W. Jeffreys combed the written sources and the African linguistic and archeological evidence and came to the conclusion that maize *was* known in West Africa in pre-Columbian times. He suggested it had been introduced by the Arabs as early as the 11th century. Since no one now denies the New World origin of the grain, we are thus forced to infer pre-Columbian trans-Atlantic contacts between the New World and the Arabs of either al-Andalus or North Africa.

The archeological evidence cited by Jeffreys has been questioned: It consisted of the imprint of maize cobs on West African pottery, and this use of maize cobs to produce a decorative repeat pattern in the clay is now regarded as post-Columbian. But "knowing" that maize could only have been introduced in post-Columbian times may have influenced the dating of the pottery.



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Is there anything in the Arabic sources about an unfamiliar grain grown near Granada? Historian Ibn al-Khatib, writing in 14th-century Granada, describes a grain – or possibly a legume – grown in the environs of the city and eaten by the poor. He calls it *qatani*. Much earlier, the geographer al-Idrisi mentions *qatani* as growing in a number of places, among them West Africa. Was *qatani* maize? In classical Arabic, *qatani* is simply the plural of *qutniyyah*, and means “legumes” – peas, beans and lentils. But the Tunisian word for maize is *qutaniyyah*. And in al-Andalus, the word had a wider semantic range, being applied also to emmer wheat and buckwheat; the term might have been extended to maize – if maize existed – just as Americans today use the old word for wheat, “corn,” for maize. If the grain called *qatani* by Ibn al-Khatib was indeed maize, then someone reached America before Columbus.

Maize is first described in a European herbal in 1536, when Jean Ruell gave a confused but recognizable description of it, almost certainly at second hand. The German herbalist Leonhart Fuchs was the first to publish an illustration of maize, in his *De historia stirpium*, in 1542. He states categorically that it came from Asia and Greece – then under Ottoman rule – and passed to Germany, where it was called “Turkish wheat.” Another 16th-century botanist, Hieronymus (Tragus) Bock, says it came from Yemen. The very influential *Neuw Kreuterbuch* of another German botanist, Johann Tabernaemontanus, published in 1591, confuses the issue by distinguishing two kinds of maize, one called “Turkish wheat,” but both types are illustrated, and the illustrations are unambiguously of maize.

When Ruell gave the first scientific – and very brief – description of maize, which he calls “Saracen millet,” he said it was grown in French gardens and “was brought to us fifteen years ago.” His *De natura stirpium* was published in 1536, so a conservative date for the first appearance of maize in France would be about 1520. Like his successors, Ruell thought maize originated in the Islamic world, hence the term “Saracen millet.” It is striking that scholars closest in time to the discovery of the New World ascribed an Old World origin to the new grain, and seem to have done so almost unanimously.

The year 1520 is only 28 years after Columbus’s first voyage. Even accepting that Jean Ruell’s “French gardens” were probably botanical gardens, where maize was grown as a rarity, rather than ordinary kitchen gardens, the length of time between discovery and cultivation is still remarkably small – and it can be narrowed even further. In a curious note on an autopsy performed on an elderly subject, Leonardo da Vinci describes the liver and the veins which feed it as crumbling “after the manner of maize or Indian millet when their grains have been separated.” Leonardo died in 1519, but we know that his notebooks of anatomical drawings, in which this passage occurs, were complete two years before his death. They may have

been completed even earlier, for a note in Leonardo’s hand reads: “This winter of 1510 I look to finish all this anatomy.” If he completed his anatomical studies on schedule, the reference to grains of maize dates to 1510 or 1511 – very early indeed, although still only two or three years before the first mention of maize in China.

There is another reference to maize in Leonardo’s notebooks that may be even earlier. In the second of the three “Forster” notebooks, now in the Victoria and Albert Museum in London, there is a curious list that can be dated to between 1500 and 1505. It reads: “Beans, white maize, red maize, panic grass, millet, kidney beans, broad beans, peas.” Two sorts of maize are mentioned, as they are in much later herbals. Panic grass and millet were commonly classed with maize in the 16th century because of the general similarity of stalk and stem. In fact, Columbus himself used the Spanish word for panic grass to refer to maize the first time he saw it, and in Portuguese the old word for millet, *milho*, now means maize exclusively. The term Leonardo uses for maize is *meliga*, now one of the several Italian words for maize – but it originally meant sorghum, and both a red and a white variety of sorghum were cultivated in Italy in the late Middle Ages. Did Leonardo mean maize or sorghum? His English translator and editor thought he meant maize, and if he did – that is, if the word *meliga* had already assumed its modern meaning – this brings the first European mention of maize to the earliest years of the 16th century. The use of the word *fagioli*, now used to mean haricot beans, in the same list, may indicate that indeed *meliga* had also already assumed its modern meaning.

Now, it is possible that Leonardo personally encountered maize on a journey to the Levant. His notebooks contain an eyewitness account of a natural disaster that struck an unnamed city – probably Tarsus or Adana – in the Taurus region of Anatolia. The letter was written while Leonardo was on a mission to that region for the Mamluk authorities, a trip that may have taken place between July 1505 and March 1508.

The fertile plain to the west of the Taurus Mountains is ancient Cilicia, a powerful Armenian kingdom in antiquity and later in the Middle Ages. Traditionally, sugarcane and cotton were grown there. Leonardo describes it in his letter: “This mountain at its base is inhabited by a very opulent people; it abounds in most beautiful springs and rivers; it is fertile and teems with everything that is good and especially in those parts which have a southern aspect.” Is it possible that it was here that Leonardo first encountered maize? If so, it would explain his precocious familiarity with the grain, as well as with the name by which it is known to this day in Italy – *granturco*. If maize was first sown in Cilicia, it might also explain why the Turks called it *misir*, “Egypt,” for until 1516 Cilicia was controlled by the Mamluks of Egypt. The Arabic name for maize used in Egypt, “Syrian sorghum,” would also be explained, because under the Mamluks Cilicia was administered from Syria. After



Wu Ch'i-Chun's *Chih Wu Ming Shih T'u K'ao* contains an illustration (below left) and a description of the potato plant. Above, haricot beans from the *Neuw Kreuterbuch* of 1591. Below, chili peppers in Fuchs's herbal of 1542.



SILIVASTRUM MAIUS ET MINUS. Calceolarius Pfeffer.

1517, Cilicia, Syria and Egypt all formed part of the Ottoman Empire; anything proceeding therefrom was “Turkish.”

There is another, earlier name for maize in Turkish. This is *qalambak*, a strange word of Persian origin that apparently originally meant a kind of aromatic wood. Oddly enough, this same word is used in Malaysia. Closer to home, it is the origin of one of the Greek words for maize – *kalampokki*. The other is *arabiskoi*, “Arabian.” Nearby Albania uses *kollomboc*.

It is possible that *qalambak* and *misir* referred to different varieties of maize, perhaps sweet maize and flint maize respectively. The fact remains that *qalambak* is an Oriental word, and once again, as throughout the 16th century, we find maize associated with Islamic lands rather than with the New World from which it in fact came.

The acceptance of a new cereal crop is no easy matter. It involves major changes in field and cropping techniques, to say nothing of the ritual practices that around the world often accompany sowing and harvest. Fruits like pineapples or papayas could be accepted or not accepted; their cultivation did not involve radical change. But where maize was cultivated, it replaced other grains, grains with deep cultural and economic associations. This is why it is so astonishing to find maize cultivated in China so early; it is one reason why some scholars – particularly anthropologists – have thought maize might have had Old World origins; it is why it is worth enquiring how maize might have reached Europe from the East rather than the West.

The 16th-century Chinese gazetteers studied independently by Francesca Bray and Ping-Ti Ho mention maize being cultivated not only in Anhwei province, but also in Yunnan, Kiangsu, Honan, Chekiang and Fukien. These Chinese provinces all had minority populations – Yunnan was heavily Muslim – and these minorities may have been less resistant to the new cultigen.

The earliest Chinese name for maize meant “barbarian wheat,” so it was recognized as being of foreign origin. But which barbarians brought it to China? In 1511, provinces like Anhwei could as yet have had little direct contact with the Portuguese. If the Portuguese brought maize to China, it would have been between 1500 – when they discovered Brazil – and 1511, when the grain is first mentioned in Anhwei. Eleven years is not much time for the introduction of a new cereal crop, yet this is the *maximum* time allowable if the Portuguese did in fact introduce it to China.

But there are two other regions from which maize might have come to China: India and the Levant. Years ago, anthropologist Berthold Laufer suggested that maize reached China overland from India. This is not impossible, but maize is not mentioned in the exhaustive *Ain-i Akbari*, composed around 1590. On the other hand, there may be a reference to maize in the memoirs of Babur, founder of the Moghul dynasty. He compares the leaves of the plantain to a plant he

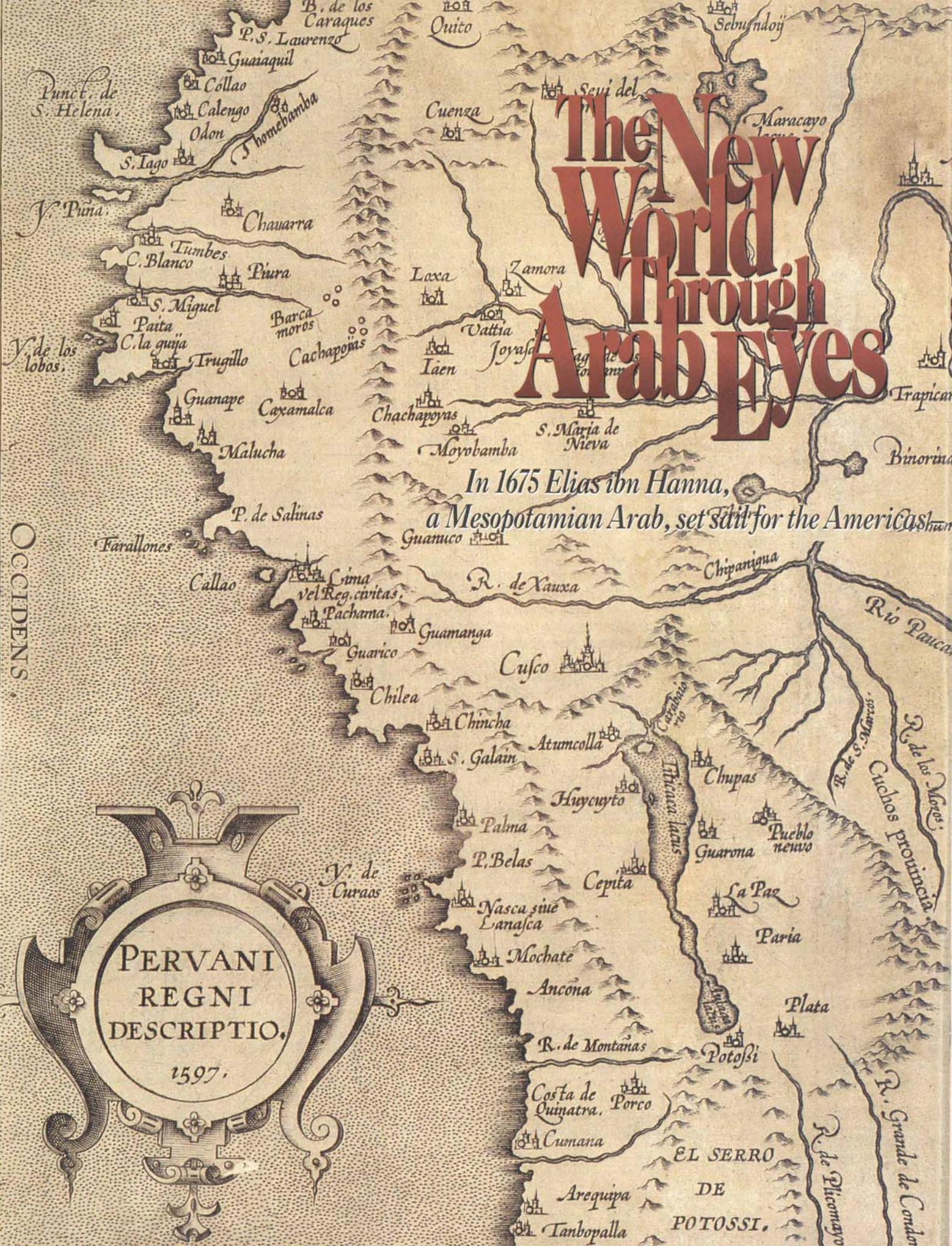
knew from Transoxiana, which he calls *aman-qara*. It has been suggested that *aman-qara* was maize. If so, this would give a date late in the 15th or early in the 16th century for the cultivation of maize in Transoxiana, from where it could have spread overland to China via the Silk Road, which also passed through the Levant.

There are various possible routes by which maize might have reached the Levant. The most obvious is that it was brought by *moriscos*, Muslim refugees from Spain, who in the years after the fall of Granada in 1492 sought refuge in both Mamluk and Ottoman territories. Another possibility is that maize was encountered in Spanish ships returning from the New World, captured by corsairs in Ottoman service or by Ottoman ships of the line: The Columbus map reached the Ottomans in just this way. A third possibility is that Peter Martyr, chronicler of the discoveries, brought it to Islamic lands himself. He was sent to Egypt on a diplomatic mission in 1501 and he may have taken samples of maize and other New World exotics with him, to demonstrate the reality of the recent discoveries to the Mamluk court.

There is, unfortunately, no evidence for any of these theories. What does seem to be certain is that maize was cultivated in China and perhaps in Islamic lands before it was cultivated in Europe, and that it entered Europe indirectly, via Ottoman territories. This would explain why contemporaries associated the new grain not with the New World but with Asia – in particular, Islamic Asia.

For those who feel that the period of time between the discovery of maize and its first cultivation is still too short, there is a fourth possibility: pre-Columbian voyages to the New World. More than 30 years ago, H. H. Li suggested, on the basis of Chinese geographical texts, that Arabs made regular voyages to the New World as early as the 11th century. These Chinese texts describe voyages in very large ships to a county called Mu-lan-p'i, one hundred days' sail to the west. Li pointed out that these could hardly have been voyages from, say, Egypt to Spain or North Africa, because the texts specifically state that the sailors spent one hundred days out of sight of land – virtually impossible in the Mediterranean, where the maximum distance between landfalls is barely 500 miles.

However attractive this theory is, Arabic sources, though prolix and plentiful, do not mention such voyages – with the exception of those undertaken by the *mugharrirun*, which cannot be called regular trading voyages with the New World. What is possible is that, in the century preceding Columbus's discovery, someone else reached the New World and brought back maize. This would resolve many of the mysteries about its dissemination, explaining the troubling passage in Peter Martyr and allowing a longer time for maize to come under cultivation. There was, after all, a great deal of maritime activity in the Atlantic in the late 14th and 15th centuries and – who knows – perhaps more than one “Anonymous Pilot.” ☉



The New World Through Arab Eyes

In 1675 Elias ibn Hanna, a Mesopotamian Arab, set sail for the Americas.

one of few non-Spaniards permitted to visit the Spanish domain. He recorded his adventures in the first Arabic account of the New World.

At left, Peru in 1597, as drawn by Dutch cartographer Jan Wytfliet. Potosi and its cerro can be seen just below Lake Titicaca. Portobelo, "the graveyard of the Spanish," above right, was charted in the 18th century by the Italian Violante Vanni. On the following pages, marine decorations from Jan van Doet's 1585 map of northern South America.

In the year 1493, a sailor from the kingdom of Portugal named Rui Faleiro came forward, with a friend of his named Fernando Magellan. The latter was on his way back from the East Indies, which are at the limit of the clime of Asia, when he...was driven by the wind to an island in the Atlantic. He calculated its latitude and then God smoothed his way and he returned to Spain. He was eager to return to that island and explore it.

Now it happened that Rui Faleiro was the guest in the city of Seville of a certain man skilled in seafaring named Christopher Columbus. Rui Faleiro fell ill and began to tell Christopher about those islands, saying: "In the Ocean Sea I found some islands and they are in such-and-such a latitude." A few days later he died.

Christopher Columbus then fitted out a ship and sailed the Atlantic intent on the discovery of the islands about which Rui Faleiro had told him. After many days and great difficulties, he reached an extensive land among those islands and explored it.... After he had examined it and learned its latitude and seen the Indians who dwell there and made friends with them and given them gifts, he decided to return to Spain. He took six of those Indians with him and after a number of days arrived in Spain.

He went before the king, who was named Don Fernando, and the queen, who was named Doña Isabel. He showed them the Indians and told them of everything he had seen and of the country he had discovered.... Some days later the king ordered a ship to be given to Christopher Columbus and that he be accompanied by a learned man, versed in many matters, named Don Alonso de Ojeda, so that this man too should explore the Indies and see whether or not everything Columbus had said was true....

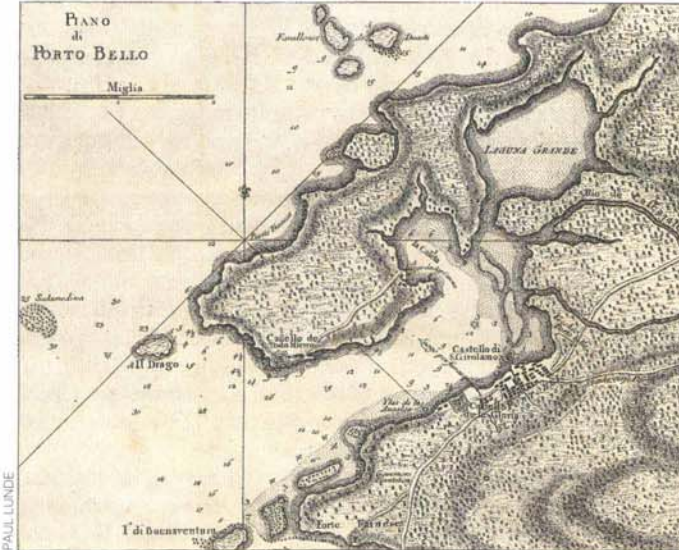
In their company was a man named Amerigo Vespucci, from the city of Florence in the country of Italy. This man was a ship's captain and was very skillful and intelligent. He drew that country and its Indians on a sheet of paper and presented it to the king. Thenceforth, they called that country - which is in the fourth clime - "America," for the historians have said that anyone who discovers a country or founds a city may call it after himself. The truth is that it should have been called after Columbus, for it was he who both initiated and carried out the expedition....

A few days after his return, [Columbus] died in a city called Valladolid, the capital of the rulers of Spain. They held a funeral service for him with full honors. They carried his body to Seville, his native city, and buried him there.

So reads the first Arabic - as opposed to Ottoman Turkish - account of the discovery of America. It was written toward the end of the 17th century by a Chaldean Christian Arab from Mosul, who had been educated by the Capuchin friars in Baghdad. His name was Elias - in Arabic, Ilyas - ibn Hanna al-Mawsili, "Elias, son of John of Mosul."

Elias and his brother 'Abd al-Masih both spoke fluent Kurdish in addition to Arabic, Turkish and a spoken form of Syriac. During his travels, Elias learned Italian and Spanish as well, and he probably knew at least some French from his years with the Capuchins. He made three trips to Rome by sea from Iskenderun, the port city that served Aleppo. It was the third trip that set the stage for the extraordinary adventure that eventually led him to Peru and to the silver mines of Potosi.

In 1668, Elias left Baghdad in the company of an Ottoman artillery officer, Michael Condoleo, known as Michael Agha. Despite being well-escorted and armed, their little caravan was attacked in the desert by about 100 Bedouin, whom they succeeded in driving off with their muskets. From Damascus, Elias went to Jerusalem to visit the holy places, and then made his way to Aleppo and finally to Iskenderun, where he boarded an English ship bound for Venice. The



voyage to Venice, via Cyprus, Crete, Zante, Corfu and Cephalonia, took 70 days - almost twice the time it took Columbus to sail the Atlantic on his first voyage in 1492.

After 40 days in quarantine in Venice, Elias spent another 20 enjoying this most beautiful of Mediterranean cities, then made his way to Rome, where he stayed six months. He then departed for France.

Elias was received in Paris by Louis XIV, a signal honor and one rather difficult to explain. Had Elias been charged with a secret diplomatic mission of some sort? Louis XIV did not normally receive humble travelers, however exotic. The fact that Elias presented a sword to the king's brother, the duc d'Orléans, also seems to indicate an official mission, but on this Elias is silent.

In the summer of 1669, an envoy from the Ottoman court named Süleyman Ağa arrived in Paris. When it transpired that the Turkish-language skills of the court translator were not up to the task of dealing with



formal Ottoman, Elias acted as translator. He must have met Antoine Galland, the famous translator of *The Thousand and One Nights*, who accompanied Süleyman Ağa on his voyage back to Istanbul, and he may even have met Molière, who satirizes the entourage of Süleyman in *Le Bourgeois Gentilhomme*.

After eight months in Paris, Elias set off for Spain. He had an audience in Madrid with the queen mother, regent for Charles II, who was still a young boy. He presented his credentials and she gave him letters to her viceroys in Naples and Sicily, ordering them each to pay him the sum of 1000 pieces-of-eight.

This money was ostensibly to repair a church in Baghdad, damaged in the siege of 1638, when Elias had been a small boy in Mosul. It was for the same professed purpose that Elias eventually went to South America -- to gather alms for the Chaldean community, utterly destitute and without resources.

So Elias set off once more, this time to Naples and Palermo. The Spanish viceroys in these two cities refused to give him a penny.

When he returned to Madrid and informed the queen, "she was very annoyed that her order had not been obeyed," but was herself unable to find 2000 pieces-of-eight for Elias. Despite the vast quantities of gold and silver flowing into Spain from the mines of Mexico and Peru, the Spanish court was chronically in debt at this time, and this was even more true of the viceregal cities of Naples and Sicily. Although the armada that arrived in Cádiz in September 1671 brought 7,326,420 pieces-of-eight worth of silver and gold, there was apparently not even enough money in the treasury for the queen and her son, the future ruler, to visit the Escorial, the magnificent 16th-century monastery-palace of Philip II. The king, who was 11 years old at the time, wished to inspect the damage caused by the great fire that year, in which so many Arabic and other manuscripts were lost.

Elias left Madrid in disgust and went to Portugal. He spent seven months in Lisbon, the city from which the *mugharrirun*, or "intrepid explorers," had set out on their mysterious voyages so long before, and from which now, Elias says, "ships sail to the East Indies, to the city of Goa."

Elias then returned to the Spanish capital. He must have made powerful friends, for he stayed with the duke of Aveiro. The duchess was a talented poet and scholar who financed the Jesuit Eusebio Kino's reconnaissance of Sonora and Arizona and was actively involved in missions to China, India, the Philippines, Mexico, Peru and the Marianas. She must have been interested in Elias's accounts of Kurdistan, and almost certainly provided him with references to the new viceroy of Peru, the Conde de Castellar, whose wife was a close relation.

Elias also met the king's *aya* or governess, the Marquesa de los Velez. It was through her that he obtained his passport to the "Indies." The queen, probably humiliated by her viceroys' non-compliance with her order, asked the Marquesa de los Velez to find out

from Elias what he wanted -- short, of course, of the 2000 pieces-of-eight he had been promised. Elias consulted his friends, and they advised him to ask for a passport to the New World. "I did not care for this idea at all, but placing the burden on God, and relying upon Him, I asked for the Royal Order, without which no stranger was allowed to go there."

Spanish America was normally strictly off-limits to non-Spaniards, and it was only by means of an order from the crown that Elias was allowed to go, for a period of four years, to collect alms for the Chaldean community. The concession of a passport to a non-Spaniard was a great honor, and it is to this that we owe Elias's account of his travels -- one of the very few accounts of viceregal Spain by a non-Spaniard. It is also the only Arabic description of the New World, and is therefore unique.

Elias went to Cádiz, the old Phoenician city from which Hanno and others had set out to explore the Atlantic 2000 years before, and now the port of embarkation for the New World. On February 13, 1675, Elias handed his passport to the admiral of the fleet, Don Nicolás Fernández de Córdoba Ponce de León -- a family name to reckon with. Elias was assigned a cabin in the flagship, stowed his gear and locked the door, and the same day the fleet of 16 ships hoisted sail and set off into what Elias calls *al-Bahr al-Muhit*, the All-Encompassing Ocean.

"We sailed out of the harbor with cannons firing and drums beating, flying flags and banners. Some of the passengers were happy and some were sad at leaving their families." Elias is silent about his own feelings; they must have been intense. He was already a long way from Baghdad and his family, and now was setting off into the unknown.

"Every three years," says Elias, "this fleet sails to a country of the Indies called Peru, which is 1500 leagues distant The merchants fill the galleons with every sort of merchandise and sell it there and on their return ... bring back treasure valued at 20 or 25 million...."

Just as Columbus did on all his voyages, the fleet first made for the Canaries, to pick up the easterlies. The crossing to the islands took eight days. They did

not stop there, but continued on their way, passing an English slaver out of Brazil midway on their journey. Their first landfall was the coast of Venezuela, after a remarkably quick passage of 44 days. Elias describes the pearl beds off the coast of Venezuela, discovered by Columbus on his second voyage. By Elias's time, the pearl beds had been fished out.

Some days later they docked at Cartagena, in present-day Colombia, where they spent 40 days, waiting for word from Peru that the bullion they had come to collect had been safely shipped to the Isthmus of Panama. Then the fleet weighed anchor for Portobelo, in present-day Panama, the great emporium of South American trade in the 17th and 18th centuries. Portobelo was a center for both profits and pestilence -- "the graveyard of the Spanish," where it was normal for half of a ship's crew to die of fever. Here the *feria*, or market, took place, with goods from Spain being exchanged for gold and silver and other things from America. Finally the merchants from Peru arrived, with 25,000,000 pieces-of-eight worth of bullion. While the fleet still lay at anchor in the harbor, it was attacked by French pirates who made off with 200,000 pieces-of-eight; by the time Spanish warships could give chase, they were long gone.

In Portobelo, Elias first encountered the South American fauna. He describes the *nigua* or *chigoe* (*Pulex penetrans*), a burrowing flea, and explains how to combat it:

"The place where it has penetrated [the skin] must be found and it must be removed with a needle without breaking it. A lit coal is placed on it and it explodes like a firecracker. If it cannot be removed, it dies inside the flesh and decays, and the man dies."

Then there were the vampire bats: "There is also a kind of large nocturnal bat in that country which attacks men while they sleep and bites them and sucks their blood. It fans its victims with its wings so that he will sleep soundly while it sucks his blood, until he is drained and half-fainting."

When the gold and silver had been safely stowed aboard, the admiral of the fleet sent for Elias so that he might see it: "I saw gold and silver past counting," Elias wrote. He must have found the queen's inability

to raise 2000 pieces-of-eight even more perplexing now that he had seen the fabled riches of the Indies with his own eyes.

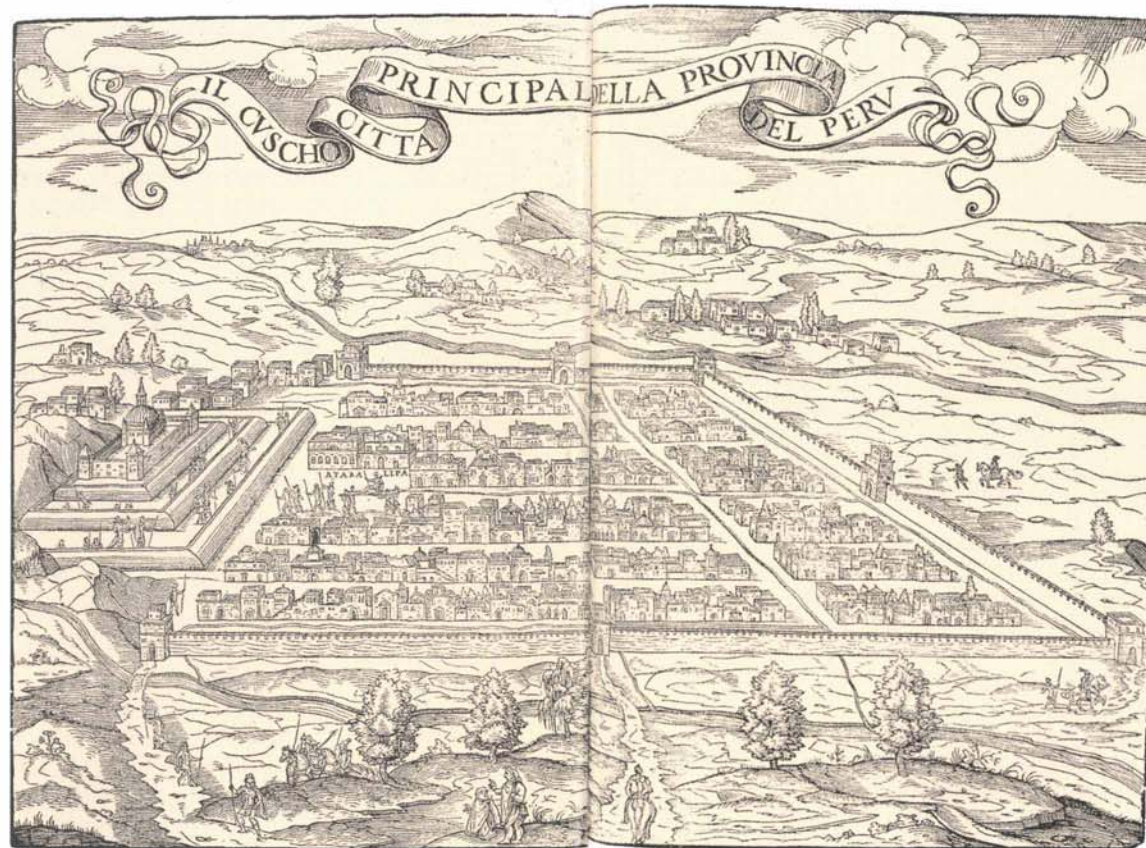
"The galleons took aboard the silver and gold as well as some merchandise, such as the fine wool they call *vicuña*, and cacao, which is like coffee in taste and smell, but richer." The fleet set off on the long voyage home, via Cartagena and Havana. But Elias hired three mules for 90 pieces-of-eight and set off across the isthmus for the city of Panama, following the course of the Chagres River. On the way he encountered "sympathetic grass," against which he had been warned by the governor of Portobelo. When a man passed through it, it rose up and slashed him, the wounds always resulting in death. "I don't believe it," Elias recorded, "and won't until I see it with my own eyes!" Fortunately, when he did, the grass responded to the command "Down, o dog!" and Elias passed safely to the city of Panama.

Old Panama had been burned down by the British buccaneer Sir Henry ("Bloody") Morgan three years before Elias' arrival at "New Panama," about eight kilometers (five miles) from the old city. Like the old, the new city was built of wood. Elias stayed for a month, made welcome by the bishop, Don Antonio de León y Becerra, who became his good friend. Don Antonio was busily engaged in rebuilding Panama, supervising the construction of the fortifications.

Elias then took ship for Peru, sailing "The Blue Sea," or "The Southern Sea," as the Spanish called the Pacific. It is strange to think that although this was probably the first time anyone from Baghdad gazed west across the Pacific, Baghdadi merchants sailing the China Sea had undoubtedly gazed east across the same waters and wondered what lay in that direction.

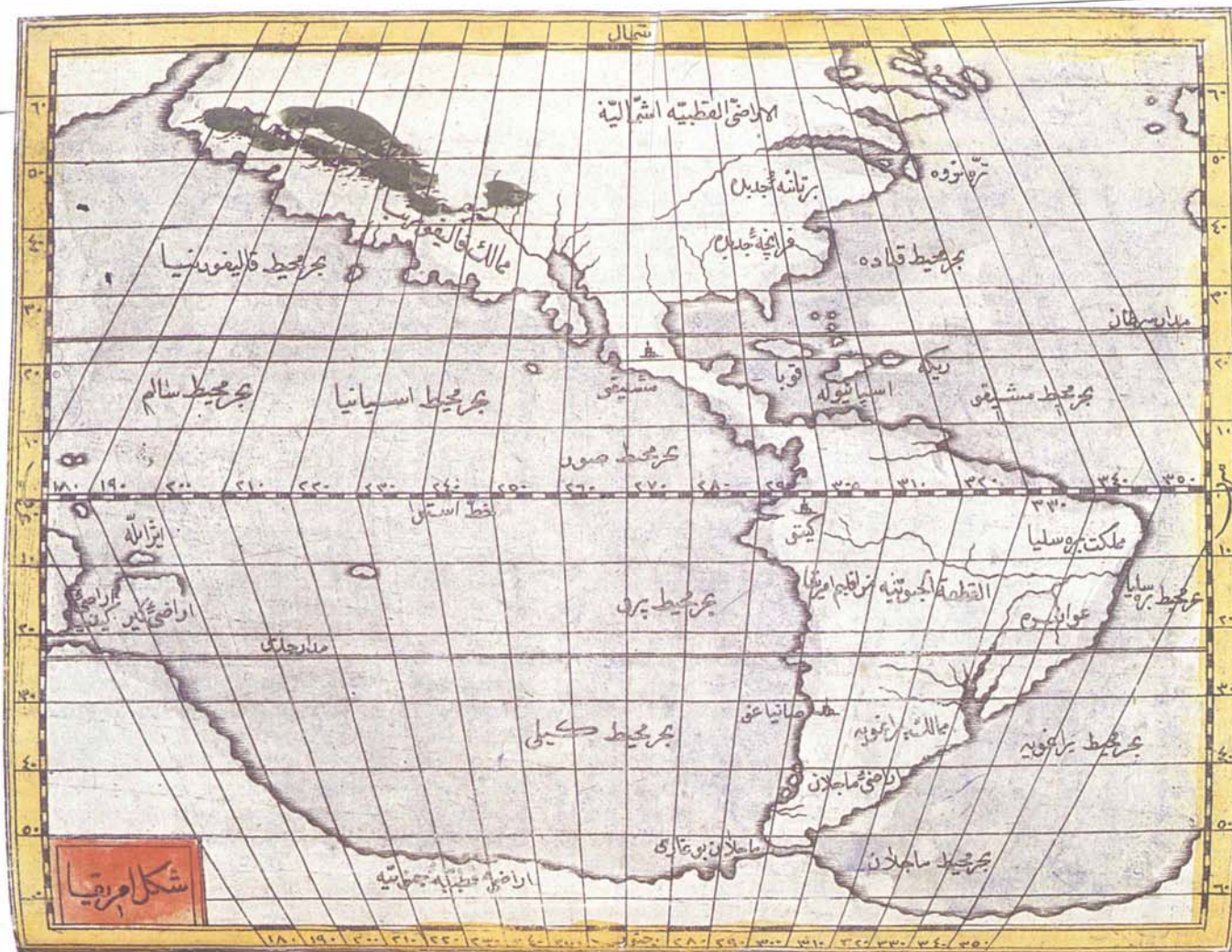
They stopped at the island of Gorgona, where the conquistador Francisco Pizarro and his 13 paladins had been marooned, and from which the conquest of Peru was launched. Elias and his companions were caught in a vicious whirlpool and only saved by a miracle. Finally, after a month at sea, they made the port of Santa Elena. Elias had had enough of the sea, and he and his friends decided to continue their journey on foot:

At Santa Elena, ... a certain Indian ... told us that about one league from this port there was a large cave where giants were buried. He also said that when the Spanish ships first came to that country and conquered it, the Indians thought their ships were fish and that the sails were fins, because until that time they had never seen a ship. And when they saw horses, they thought they and their riders formed a single being. When I heard the story of what had passed in that country and of the giants buried there, I became very eager to see them for myself. I took with me a company of Indians, twelve men accustomed to bear arms, and we went to look for the cave and see for ourselves the things he had described. When we arrived, we lit the candles we had brought with us, for fear of losing our way in the cave. Then we went in, each man walking with a candle in his hand.



Cuzco, capital of Inca Peru before the Spanish conquest, was still an important town when Elias ibn Hanna visited it in the late 17th century. This view is from the 1583 *Navigazioni* of Ramusio.





A Turkish map of the Americas, at left, engraved by Ibrahim Muteferrika to illustrate the *Jihan Numa* of Hajji Khalifah, printed in Istanbul in 1728. At right, the Inca king Atahualpa and his queen, illustrated in the *Encyclopedia Londinensis*, 1823. Elias gives a detailed account of the capture and death of Atahualpa at the hands of Pizarro's conquistadores.

Every 10 paces we left a man holding a light, so that we could find the way back to the entrance. I preceded them, carrying a naked sword. I then came to a place where there were bones and I saw that they were very thick. The skulls were huge. I tried to remove a tooth, a molar, from one of them; it was so big that it weighed 100 mithqal [almost 500 grams, or about one pound]. I looked at the thigh bones and measured one of them and found that it was five spans [45 inches, or 110 centimeters] long. In one of the towns an artist had made a reconstruction of one of these bodies, and it was 25 spans [about 19 feet, or 5.7 meters] high. Then we left the cave, marveling at what we had seen. I took the tooth with me.

These were doubtless bones of mastodons and giant sloths (*Megatherium*), many of which have been found on the peninsula of Santa Elena, although the cave so bravely investigated by Elias has apparently eluded modern investigators.

Elias and his party set off for Guayaquil, another port town on the Pacific. They passed through heavily wooded territory, and Elias was much struck by the crocodile-like caimans that infested the rivers in those days: "If a horse or bull comes to drink water from the river, the caiman grabs him by the nose, drags him away and devours him. Other caimans then gather round, tear the prey in pieces and eat him up."

Then he tells how the Indians capture caimans: "They take a piece of wood half a cubit long, sharpen both ends and tie a piece of strong cord to the middle. This piece of wood is seasoned and polished like a sword until it is hard as steel. Then one of the Indians goes and sits in hiding beside the river so that when the animal comes out and sees the Indian it opens its mouth in order to eat him. The Indian then crams the piece of sharpened wood into the animal's mouth. As the creature tries to close its jaws they are impaled on the end of the stick. The more it bites, the deeper the points sink into its flesh. The Indians pull it to land with great difficulty and turn it over on its back to prevent it from walking. Then they cut it to bits."

Elias watched while the Indians demonstrated their method. As he did, a young Indian boy slipped into the water and was immediately gobbled up. They succeeded in capturing the caiman responsible and executed it, first removing from its belly pieces of the unfortunate youth for burial.

In Guayaquil, Elias ate his first chocolate – probably the first Arab ever to do so. At this time chocolate, made from ground roast cacao beans, was most often taken as a drink, as it still is in Spain. "You would imagine it to be coffee in color, taste and smell, but it is very oily, so that it forms a paste. They add as much sugar as is required, and cinnamon and ambergris.

Then they mix it to a paste and place it in molds until it sets. They melt the bars of chocolate and drink it like coffee. This fruit is popular with everyone in the land of the Franks, to which it is exported and sold."

Elias spent two months in Quito as a guest of the bishop, Don Alonso de la Peña Monte Negro, whom he had known in Spain. It was during his stay there that Elias lost his giant's molar, to his great regret. He also practiced amateur medicine, achieving a successful cure by using the sap of a large cane he had found growing near Ambato, and he also bought a little alluvial gold, probably panned in the Rio de Santa Bárbara and washed down from the slopes of the nearby volcano, Mount Pichincha.

After two months in Quito, Elias traveled to Otavalo, a town on the equator, and then crossed the páramo, or mountain heights, to Cuenca. The governor of Cuenca had been a shipmate of Elias's on the voyage out from Spain. He was very glad to see Elias and, to entertain him, he organized a bullfight: "He wanted to hold a fiesta to amuse me; in the land of Spain they call this entertainment 'the festival of the bull.' This is how they do it: First they surround a plaza with wooden fencing to protect the houses. Then they place benches, one above the other, I mean like a staircase, and everybody gathers together and sits on these benches, each person buying a place for the sake of the spectacle. Then they bring one of the wild bulls of the country into the plaza in a cage and loose him. The plaza is surrounded with people and he runs nervously about, but sees no way to escape. Next a horseman with a lance in his hand enters and teases the bull. The bull alternately charges him and flees, and at last they kill it; but sometimes the bull kills the horse and its rider with its powerful horns..."

Departing from Cuenca, Elias made for the gold mines of Zaruma, traveling via Loja through pouring rain on a rough passage through the mountains. Zaruma, says Elias, "is on the top of a mountain, surrounded by gold mines. I inspected all the processes by which they extract the gold from the ore. First they remove the gold from the mine and crush it with a water-driven mill. Then they wash the crushed ore and separate the dust from it by means of running water. Then they smelt it and form it into bars." Elias bought about 1800 grams (58 troy ounces) of gold here, so he was evidently prospering. His interest in mining technology seems unusual, and one wonders again, as in his reception by the French king, whether he may have had other motives for travel than gathering alms to rebuild a church in Baghdad.

Elias took a different route back from the mines of Zaruma, on the advice of the local priest. It was a desert road, and he hired two muleteers to show him the way. The first night on the road, they tried to kill him, presumably to steal his gold, but Elias disarmed them and they fled. At the next town, the Indians were amazed at his bravery. "They were astonished at me because of my full beard, and said that I must be very brave to have passed through that country."

We know that Elias usually dressed in Oriental fashion, presumably in caftan and turban. He must have been a strange and exotic sight, riding out of the desert and entering the Indian village of Guachanama, like a figure out of a dream.

When he reached Amotapé, the local priest told Elias that the thieves who had attacked him had also murdered the priest's brother on the same road. Elias compares the Rio Colán, that runs through Amotapé, to his native Tigris. He wrote to a friend, the governor of Piura, and asked him to send a litter to carry him to Piura, via Paita. "As soon as he received my note, he sent me a litter, for in that country one becomes extremely tired traveling by horse because of the heat and the sand."

He continued south, heading for Lima, and near Saña the country changed to heavy forest. As Elias says, "Entering this forest is a formidable undertaking, for it has no beginning and no end." His muleteer dozed off and they lost their way. Elias sensibly stayed where he was, lighting a signal fire and tying a white banner to the tallest tree. The next day, a search party found them, having sighted Elias's banner.



The road to Trujillo was difficult too, "with few camping places and nothing to eat." Elias alternately rode and was carried in his litter. He rested in Trujillo, where he was warmly welcomed, as always, but after only 10 days set off again.

He crossed the River Santa on a balsa raft – this word occurring here for the first time in the Arabic language – which he compares to the rafts of inflated skins used on the Euphrates. He traveled through fields of sugarcane, wheat and maize and noted the workshops where excellent woolen cloth was made. At last he arrived in Lima, where he lodged with the president of the Inquisition, Don Pedro de la Cantera, to whom he had lent 1400 pieces-of-eight in Portobelo. The money was now returned to him with 40 percent interest, "as is the practice of merchants in that country." Where he got 1400 pieces-of-eight in the first place, Elias does not say.

After resting from the fatigues of his journey, Elias presented his letters of recommendation to the viceroy, Don Baltasar de la Cueva Enríquez Arias de Saavedra, Conde de Castellar, second son of the duke of Albuquerque. "He welcomed me with great joy and promised that he would help me in any way he could."

Elias became fast friends with the viceroy and his wife, and when Elias fell ill, probably from fatigue, the viceroy sent to enquire after his health twice a day and provided him with sweets. One is struck, reading the travels of Elias, by the civility he encountered everywhere in South America and his numerous friendships with both prelates and secular leaders. He had a gift for friendship, and was extremely loyal – as we shall see.

It was probably in Lima that Elias first began to take an interest in the history of South America. Good libraries were available, and any number of learned men. Describing the situation of the continent's natives when the Spanish arrived, Elias writes, "... no one knew the True God; some worshiped idols, some worshiped the sun, moon and stars. They had no alphabet and did not know how to read and write. When they wished to present a petition to their king, they used to express their desires by drawing pictures on a piece of cloth Their weapons were bows and arrows, spears, and slings for throwing stones. They had no domestic animals, like horses, mules and donkeys ... nor did they have bulls, cows, sheep or chickens. They do have an animal like a camel, but smaller, about the size of a donkey, with its hump on its chest, which they use to carry loads for them and whose flesh they eat. It does not have much endurance – each day it travels no more than four leagues, and when it gets tired, it falls asleep and foams and spits on its companions. When one of the Indians died, they used to make a high tomb for him, about two cubits high and three cubits long.

Then they would put the tools of his trade in the tomb, together with a kind of wine made from millet."



Modern historians might be interested in the reference to Inca pictographs, the existence of which, though long denied, has recently been asserted.

Elias spent a year in Lima, living in the house of Don Pedro de la Cantera, who kindly defrayed all his expenses. This was a great advantage, for Lima was an expensive town – a chicken, says Elias, cost one and a half pieces-of-eight.

Elias was anxious to visit the mercury mines at Huancavelica and the silver mines at Potosí, and, thanks to letters of recommendation from his friend the viceroy, he was able to do so. He crossed the high Puna de Pariacaca, crossed the famous and perilous

suspension bridge slung over the Puni River, and in 10 days arrived at Huancavelica:

I went to look at the mine with the governor of Huancavelica. I saw its great size and how the workers cut out the ore and brought it to the surface. They showed me how they extracted the quicksilver. They took me into a room where they had made holes in the floor and put a vessel in every hole; these vessels were joined together and arranged in rows. They had two openings, one at the top and the other at the bottom, but the bottom one was sealed, like a jar. They stack the quicksilver ore in layers over the vessels, as a potter does in a kiln. The room is closed, but it has a high, strong roof with

Northern South America, drawn by the Dutch cartographer Jan van Doet and published in 1585.

vents to allow the smoke to escape. On top of the ore they pile wood and set fire to it. As it burns it heats the ore to a high temperature so that the quicksilver begins to flow, running down and collecting in the vessels. The workers know when this has happened and extinguish the fire and leave it a day and a night to cool. They next remove the slag and the ashes and deposit them outside and pour the quicksilver out of the vessels.

The quicksilver was destined for the silver mines, where it was used in the mercury amalgamation process to refine the silver.

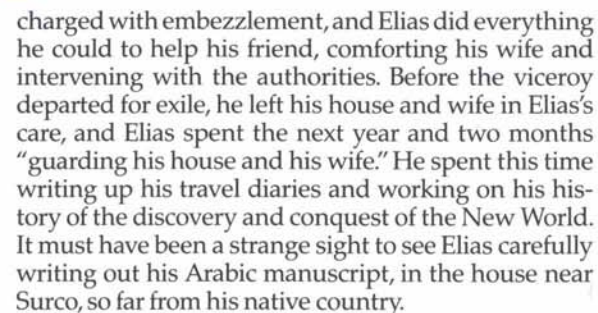
Traveling onward to Cuzco, Elias crossed another suspension bridge, over the Apurímac: "A bridge woven of tree-roots and branches spanned the river. It was one cubit wide, a little more or less, and 20 cubits long. We crossed it with great difficulty and fear. The burdens were unpacked from the mules and the Indians carried them to the other side on their backs, one by one, whipping the mules to make them run across the bridge. The bridge was made of planks laid cross-wise and if the hoof of a mule slipped between, the Indians simply picked up the planks and let the mule fall through the gap into the water. The mule then swam to the other side of the river."

They passed through the extensive sugar estates in Abancay and arrived in Cuzco. Elias was much impressed with Indian craftsmen, and astonished at the huge blocks of stone worked by the Incas without iron tools. Elias made a special expedition in the region to examine the ruins of other Incan buildings and tombs. He stayed five months in Cuzco, then left for the silver mines of Condoroma and Caylloma. Again, he gives a good technical description of the method of silver refining, about which he was endlessly curious.

Elias went on to Lake Titicaca, apparently to visit the king's smelter at Chucuito, then on to Potosí.

Potosí, in present-day Bolivia, was the site of the richest silver mine in the world, 4900 meters (16,000 feet) above sea level. This was the main source of the silver that was flooding Europe and the East and causing such severe inflation (See "American Silver, Ottoman Decline," in this issue). The mines were discovered in 1545; by 1572, the Spaniards had set up an elaborate system of artificial lakes – whose total storage capacity reached 6,000,000 metric tons in 1621 – and ore-grinding machines driven by hydraulic power. Elias gives a very detailed technical description of mining and refining, and then describes the mint, the Casa de la Moneda, at some length. He stayed in Potosí 45 days, a long time in such an inhospitable place.

After visiting friends in Charcas – the most southerly point in his travels – Elias returned to Potosí, and then made his way back to Lima by the coastal route. He discovered that in his absence, his friend the viceroy had been dismissed from office and was about to be exiled to Paita, the desert town through which Elias had passed so long before. The viceroy had been



Elias had now been in Peru six years. A new viceroy arrived to take office and Elias decided to accompany his friend the Conde de Castellar to Portobelo. They left the port of Callao on September 21, 1681, bound for Panama, and arrived safely in 42 days. The viceroy apologized to Elias for being unable to help him further, and wrote him a letter of recommendation to the viceroy of Mexico.

The bishop in León, in Nicaragua, turned out to be a man Elias had met in Paris many years before. He was delighted to see Elias and gave him a good riding mule. In the streets of León, he ran into an acquaintance from Lima, who gave him another, and eight days later Elias set off overland for Mexico City. He crossed the Gulf of Fonseca in a canoe and made his way through Indian villages – all of which he names – to San Salvador. He describes the method of indigo cultivation, another product that, like sugar, had once been an Oriental monopoly, but was now being produced more cheaply in South America.

Elias's appearance in Mexico City on July 8, 1682, caused a sensation: A contemporary diarist says he

was dressed in a silk soutane, or cassock, with a white collar, and wore a turban on his head, like a Turk. When he recovered from his illness, he rented a house, furnished it and purchased some mules. He visited the viceroy every evening for two hours.

Elias stayed in Mexico City for six months. Toward the end of his stay, the port of Veracruz was attacked by pirates, led by Laurent de Graff and Nicolas van Horn, who took the city with great bloodshed and looted it ruthlessly, making off with a booty of 8,000,000 pieces-of-eight. Elias lost his cargo of cochineal, which he had stored in Veracruz, and which was worth 1000 pieces-of-eight. His description of the sack of Veracruz is one of the most graphic passages in his *Travels*.

Elias wanted to sail westward to the Philippines out of Acapulco with the Manila galleons, then catch an Armenian ship out of Manila to Surat in western India, and so make his way back to Baghdad. At the last minute, these plans had to be canceled, and instead Elias returned eastward to Spain. If he had been able to carry out his original intention, he would have been the first Arab to circumnavigate the globe – as far as we know!

Elías left Veracruz on April 18, 1685, and sailed to Cuba, where he spent four and a half months waiting for a ship to Spain. He took the rather odd gift of dried onions to the governor: Apparently onions did not grow well in Cuba. Then he caught a ship bound for Spain out of Caracas and finally, after a relatively easy passage, entered the harbor of Cádiz. "There were men-of-war belonging to the king of France anchored outside the harbor and men-of-war belonging to the king of Spain anchored in front of them. When we passed into the harbor between the men-of-war and saluted them with cannon fire, both the French and the Spanish ships returned our salute. The cannons continued to fire from both sides until the smoke from them was like fog. Then we entered the harbor and cast anchor."

Elias was allowed to pass through customs without having his chests opened. He brought with him four parrots and a silver candlestick of "wonderful workmanship." He went to Seville, engaged in a successful lawsuit against a ship captain who had defaulted on a debt, and then journeyed to Rome, where he presented the candlestick to the Propaganda Fide, the church's missionary organization. Pope Innocent XI made him an apostolic protonotary – an honorary position that involved no duties – and other high honors followed.

After many other adventures, Elias finally returned to Spain, where he spent his declining years in the charming Atlantic port town of Puerto de Santa Maria. Here he finished his *Travels* and completed his history of *The Discovery and Conquest of America*. These two books must have been the last works of Arabic literature composed in al-Andalus; it is fitting that they should be devoted to the New World, on the far side of the Sea of Darkness. 🌐

An armillary sphere illustrated in the first printed edition of Hajji Khalifah's *Jihan Numa* (*Mirror of the World*). The book, published in Istanbul in 1728 but written in the 17th century, is a comprehensive atlas and geographical handbook, based on both European and Islamic sources and illustrated with many fine maps and diagrams.

