ANCHOR IN A SPANISH RIVER, FIVE SHIPS, waiting. Old ships, patched, small, untrustworthy. Aboard them 948 cheeses, 1,512 pounds of honey, 3,200 pounds of raisins, much pickled pork, a two-year supply of biscuits. Wine, rice, lentils, flour, provisions for a long journey. A mingled crew, Spaniards, Italians, Frenchmen, Basques, Greeks, a Malayan, an Englishman. For a Spanish fleet, a Portuguese commander: Fernão de Magalhães, called Hernando de Magallanes by the Spaniards, Ferdinand Magellan by posterity. Under harsh September sunlight Magellan readies his vessels for departure. The year is 1519. The destination is the Moluccas, the islands where spices are grown, a cluster of fragrant isles in a distant sea.

Grim, limping, austere Magellan expects it to be a long voyage. He goes westward into the Atlantic to seek the Spice Islands, though he knows they lie in other waters. The damnable massive continents of Columbus stand between Magellan and the Moluccas like high green walls cutting ocean from ocean. Never mind; he will find a sea route westward to the Indies, a strait to take him past those two slabs
of land. He knows the strait is there, just as he knows that Jesus and the Virgin guide him, that the King of Portugal loathes him, and that the throbbing in his wounded leg will not leave him. For God, for Spain, and for his own private profit and glory, the little Portuguese will find that strait. And traverse it. And leave his body beyond it on the shores of a strange sea, though that is no part of his plan.

Sailing around the world is likewise no part of Magellan’s plan. He believes that the circumnavigation is possible, of course, or he would never lift anchor in the first place. But the homeward leg of that voyage, past the Spice Islands, would take him through waters where only Portuguese ships lawfully might sail. Magallanes is no longer Magalhães; a Spaniard now, he has no wish to trespass on the seas of his former country. That is the whole point of this enterprise: to reach the Moluccas without trespass, by a new route, to lead Spain to the source of spices and to return the way he came, snatching cloves and peppers away from Lisbon by brilliant geographical achievement. So this is not to be a world-girdling voyage—not as of September 1519.

Plans change. Men die. Most of those who wait here, at anchor by the mouth of the Guadalquivir river, will never see Spain again. Some will return in cowardice to their starting point, timidly resigning from the grandest maritime adventure in human history. The others, those who from stubbornness or foolishness or luck or greed see the mission to its end, will make the longest voyage of all, to the ends of the Earth and back. A trespass, a calamity, a circumnavigation—a miracle of seamanship.

The port of departure is Sanlúcar de Barrameda, 75 miles downriver from Seville. The castle of the Duke of Medina Sidonia guards the river’s mouth. The farewell parties there have been going on for weeks; the wives and mistresses of the officers gather in the castle, in the guest
chambers of the monastery, in the inns; wine flows freely; there is laughter, gambling, talk of fortunes to be won in the Spice Islands. Now the month of final preparations ends. The voyagers kneel, accept the wafer and the wine, hear the Kyrie, the Credo, the Sanctus. Confession and communion behind them, they go to their ships; figures wave from shore; guns are sounded; sails are raised. Captain-General Magellan stands apart, a small and lonely figure. A commander must always create a distance between himself and his men, but for Magellan that is no task: this private man is accessible to few, alone even in the midst of his men. He is iron, jacketed in ice, and his sailors will follow him out of fear, not out of love. He has powerful enemies among the captains of his own fleet; there are whispers of mutiny even here at the moment of leave-taking.

Tuesday, September 20, 1519. The sails fill with breeze. The wives weep and contemplate their likely widowhood. The Atlantic swallows Magellan’s vessels. The round world awaits its conqueror. He will reveal to man the nature of man’s planet; he will perish; he will live forever.

Only a spherical planet can be circumnavigated. But that medieval aberration, the concept of a flat Earth, had long since gone into the discard heap. Columbus, we like to say, proved that the world was round, though all he did was scratch a short track over a small part of its circumference. It was Magellan’s fearful voyage, and not Columbus’ swift five-week cruise, that confirmed the obvious and made the world unarguably a globe.

Primitive man, seeing the ground flat beneath his feet, extended that datum to the horizon and imagined the world as a flat disk with edges over which unwary travelers might tumble. But such an image suits only the very simple and
the very sophisticated, such as cloistered scholastics. Early man, though he depended on common sense, did not have the wit to comprehend the implications of what he saw; scholastics of any period do not bother to see at all, but spin theories to suit prior concepts. Neither the Neanderthal nor the absentminded professor could properly evaluate the shape of his planet, but almost any fisherman or sailor of antiquity was capable of deciding that the thing must be a sphere.

Babylonian court theologians taught that the Earth was a hollow mountain, floating on the waters of the deep. Egyptian priests saw it as the floor of a box, with a goddess—the sky—bending over it and supporting herself on elbows and knees. Neither Egyptians nor Babylonians were known as seafarers, and doubtless those who did go to sea had other ideas. They knew that when they stood in harbor and observed a ship approaching shore from far out at sea, the top of the mast appeared first, then the upper part of the sails, then the hull of the ship, as though the vessel were moving along a curved surface. The Mycenaean and Minoans who sailed the Mediterranean before 1200 B.C. did not show much fear of falling off the world's edge; and their successors, the Greeks of post-Homeric times, argued clearly and convincingly against the flat-Earth theory.

True, the first Greek philosopher whose name we know —Thales of Miletus, who lived in the sixth century B.C.—seems to have believed that the world was a flat disk floating on water. Thales was a clever man, but he lived in a time when speculative theorists were often too fertile with ideas. After him came Anaximander, who said that the Earth had the shape of a cylinder, with a height one-third its diameter. That at least accounted for the obvious curvature of the surface. Two generations later, Pythagoras of Samos, having studied the mysteries of Egypt and Babylonia, announced
that the world was a sphere. Though he had traveled abroad, Pythagoras was no empiricist; searching for underlying mathematical laws to explain the universe, he worked from mystical premises and gave the Earth that shape because a sphere, a perfect geometrical figure, was the only form the Earth deserved to have. Following the same notion of the necessity of a perfect universe, he put the planets into circular orbits. Pythagoras was more nearly right than anyone before him, but for the wrong reasons.

Plato, another mystic, accepted Pythagoras’ theories. He regarded cosmological questions of this sort as far less important than such matters as the search for truth and justice, but he did speak of a spherical Earth. At least, Plato said, in an ideal universe the world could have no other shape. His pupil Aristotle, a man of tauter mind, gave reasons for the sphericity of the planet. He observed that the Earth cast a circular shadow on the moon during an eclipse, and cited the experience of travelers to prove the impossibility of the Earth’s flatness. By the third century B.C., matters had advanced to the point where Eratosthenes, a member of the brilliant Hellenistic band of scientists in the Egyptian city of Alexandria, was able to compute the circumference of the Earth with impressive success. Eratosthenes measured the height of the noontime sun at Alexandria and at Aswan, figured the distance between those two points, and, with two angles and a known base, achieved a figure of 25,000 miles for the entire sphere of which he had surveyed an arc. That was extraordinarily close to the truth; but, unfortunately for Columbus and Magellan, later Alexandrian mathematicians revised Eratosthenes’ figures to make the world seem much smaller than it really is.

The size and shape of the world thus were revealed by a progression of clever men. By 300 B.C. no educated person seriously doubted the sphericity of the Earth. Finding out
what that Earth contained, though, was a different matter. One could, like Aristotle or Eratosthenes, perform wonders of intellection without leaving home; but to know what lay beyond the horizon, one had to go and look. The Greeks spoke of their familiar Mediterranean world as the oikoumene, by which they meant the known or inhabited part of the Earth. (Our word “ecumenical,” meaning “universal,” is derived from this.) Though the limits of the oikoumene were unknown, it was assumed that a single world-girdling ocean bounded it.

We sometimes tend to think of discovery as something that began with Columbus, but the Greeks were considerable explorers and gradually pushed the borders of the oikoumene outward, as did their commercial rivals, the Carthaginians, who lived on the North African coast. For Homer, writing perhaps in 800 B.C., the world began somewhere in the hazy east, beyond Egypt, beyond Assyria, and ended in the misty west, at the Pillars of Hercules, which we call the Straits of Gibraltar. Nothing of Africa was known but its northern coast; Europe north of Greece was a wild forest; everything was surrounded by the “girdling river of Ocean.” Then the world widened. A Carthaginian captain named Himilco may have passed through the Pillars of Hercules about 500 B.C., spending four months on a reconnaissance that took him to Brittany and perhaps to Cornwall. More reliably documented is the voyage of his brother Hanno down the western coast of Africa, far enough south to have had a glimpse of gorillas in Guinea or the Cameroons. If we can believe Herodotus, a Phoenician expedition a century before Hanno actually circumnavigated Africa from east to west. This was done, so we are told, at the instigation of Necho, Pharaoh of Egypt from 610 to 594 B.C. Looking for a maritime link between the Red Sea and the Mediterranean, Necho hired a fleet of Phoenicians and sent them south,
thinking that all they need do was go around Libya to find a route. To their surprise they found that Africa extended vastly beyond all expectations. Herodotus relates that "the Phoenicians took their departure from Egypt by way of the Red Sea, and so sailed into the southern ocean. When autumn came, they went ashore, wherever they might happen to be, and having sown a tract of land with corn, waited until the grain was fit to cut. Having reaped it, they again set sail; and thus it came to pass that two whole years went by, and it was not till the third year that they doubled the Pillars of Hercules, and made good their voyage home. On their return they declared—I for my part do not believe them, but perhaps others may—that in sailing around Libya they had the sun upon their right hand."

The story is vague, but that last detail rings true. Libya here means the whole of Africa; and what Herodotus is saying is that the Phoenicians, as they proceeded southward and then westward beyond the equator, noticed the sun always in the north. This would be contrary to the experience of Mediterranean peoples, but it is what would be expected in navigation of the southern hemisphere. Possibly rumor or even guesswork could have led the Egyptians to the correct picture, but it is much more likely that an actual venture below the equator yielded this knowledge. The sun indeed would stand on the right hand as voyagers from Egypt rounded Africa.

It was a journey of some 13,500 miles—taken unhurriedly, with long spells ashore for rest and reprovisioning. Unhappily, the great fact it yielded—that Africa was a gigantic peninsula surrounded by water to the south—was lost soon after Herodotus' time. Ultimately, geographers decided that Africa stretched off infinitely to the south, connected to an unknown southern land, *Terra Australis Incognita*. It remained for Portuguese navigators twenty cen-
turies later to repeat the work of the Phoenicians, coming around this time from west to east, and restore the knowledge that Necho’s sailors had won so dearly.

Herodotus, who was a fair traveler himself—leaving his home in Asia Minor to visit Egypt, fallen Babylon, the Phoenician cities, all of the Greek world, and even the Scythian barbarians north of the Black Sea—tells of another expedition sent out by the Persian ruler Darius about 510 B.C., commanded by a Greek named Scylax. Wishing to know where the Indus river flowed to the sea, Darius sent Scylax eastward from Persia to enter the Indus via the Kabul river, follow it along its course to the sea, and return by coasting the shores westward around Arabia to Egypt. Thus India became part of the oikoumene.

Another of the ancient voyagers was Pytheas, a Greek born in the Greek colony of Massilia, now Marseilles, about 360 B.C. Carthage then controlled the Straits of Gibraltar and monopolized such traffic as there was between the Mediterranean and the Atlantic; but while Carthage was temporarily preoccupied with a war against the Sicilian city of Syracuse about 320 B.C., the merchants of Massilia sent Pytheas through the straits and into the North Atlantic to blaze a sea route linking them to the chief sources of those valuable commodities, amber and tin. He coasted western Spain and Portugal, took regular observations of latitude, reached the tin mines of Cornwall, and evidently circumnavigated Britain. His latitudes were expressed in the Greek fashion, in terms of a calculation of how long the longest day of the year would be at a given distance from the equator. In the northernmost part of Britain, he said, the longest day has eighteen hours, which corresponds to a latitude of 57°58'N. in Scotland. He sailed at least as far north as a place where the longest day was nineteen hours long; this would be at 61°N. at the northernmost of the Shetland...
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Islands. Here he heard about a land called Thule, six days' sail to the north: the northern termination of the world, beyond which no man could go. The narrative of his voyage is ambiguous, but some modern partisans of Pytheas, notably the explorers Fridtjof Nansen and Vilhjalmur Stefansson, feel that he actually went in quest of Thule, entering the frozen sea above the Arctic Circle.

Through these and other journeys, most of them unrecorded for reasons of commercial security, the Greeks and their contemporaries extended the oikoumene from Gibraltar to the Ganges, from the Baltic to the southern reaches of Africa. All this comprised a single continuous land mass attainable by coastal sailing. They did not often venture into the open sea—at any rate, most of those who went beyond sight of land did not return to tell the tale—but their caution stemmed from deficiencies in their ships and their navigational abilities, not from any dread of sailing over the world's edge. The existence of some other oikoumene across the ocean had to remain a matter for speculative thinking, no more.

There were many theories. Aristotle argued for a single oikoumene, bordered by ocean. He allowed for the possibility of huge extensions of the land in the directions of Africa and India, but insisted that there was only one continent. On a spherical Earth, then, the western and eastern shores of the one oikoumene must converge, and Aristotle did not think they would be separated by an ocean of any great size. His authority was invoked much later to show that it would be an easy matter to reach India by sailing westward from Spain.

In the second century B.C., Crates of Mallus postulated four continents, separated by two river-like oceans, one running from east to west, the other from north to south, crossing at right angles. Though the symmetry of this system,
with its neatly balanced northern and southern hemispheres separated by water and an impassable zone of fire, had a certain appeal to the Greeks, only one aspect of it had any lasting geographical significance: the suggestion that below the equator lay the antipodes, a continent or continents that balanced the known land of the north.

Greek theorists also divided the world into varying climatic zones, usually five in number. At each of the two poles was a frigid zone, eternally icebound, everlastingly dead. Round the middle of the world lay the blazing tropics, a torrid zone of terrible heat. Between the frigid and the torrid were two temperate zones, a northern and a southern one. The northern temperate zone included the familiar Mediterranean oikoumene; its southern counterpart might well be equally favorable to human life, but no one in the north would ever know, for it was impossible to survive a crossing of the frightful equatorial zone. (That mariners had penetrated the tropics as early as 600 B.C. was somehow overlooked in these hypotheses.)

The climactic figure of Greek geography was Ptolemy of Alexandria, who lived in the second century after Christ. What journals of explorers were available to him in Alexandria’s vanished library we cannot even guess, but Ptolemy had only to walk down to his city’s flourishing docks to talk to men who had seen distant wonders. Alexandria was a great nexus of seaborne trade; in its harbor Ptolemy could find sailors who had gone via the Red Sea to Arabia, and on to the Persian Gulf and the coasts of India. Certainly there was traffic in Ptolemy’s time from Egypt to the Indian Ocean ports of Africa—possibly even to Zanzibar, five degrees south of the equator. From these seafarers and his own studies and intuitions, Ptolemy derived a picture of the world superior in detail to anything previously conceived.

On home grounds he was superb. His maps of the
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Mediterranean area were accurate for latitudes and even for longitudes, which were less easy to calculate. Europe, Asia, and Africa were well portrayed; but when he got beyond his knowledge, he simply invented. It was Ptolemy who concocted Terra Australis Incognita, tacking that mythical southern continent to the lower part of Africa and carrying it far to the east, where it joined Asia. This converted the Indian Ocean into a wholly enclosed sea similar to the Mediterranean and made unthinkable any hope of circumnavigating Africa. Reaching the great southern continent was impossible because of the intervening zone of burning tropics. Terra Australis was Ptolemy's only major geographical blunder, but it was a cruel heritage to leave.

After him came darkness. Rome, which had swallowed Greece, was devoured by barbarians, and out of the chaos arose Christianity to make a cult out of sacred ignorance. The early Christians, with justifiable pessimism, believed that their crumbling world was soon to pass away and that it was futile and even blasphemous to probe its secrets; the proper occupation of men was to prepare their souls for the coming City of God. Three centuries after Ptolemy, St. Augustine was warning against the "mere itch to experience and find out," and protesting that "men proceed to investigate the phenomena of nature—the part of nature external to us—though the knowledge is of no value to them; for they wish to know simply for the sake of knowing." Augustine gave thanks to God, who had freed him from the sin of curiosity! "What concern is it to me whether the heavens as a sphere enclose the Earth in the middle of the universe or overhang it on either side?"

In this era of deliberate rejection of knowledge, Greek learning was jettisoned and Biblical texts became the founda-
tion of all theory. On the first page of Genesis was a statement borrowed from the Babylonians and now thrust forth as unassailable doctrine: “And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters. And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament.” A flat terrestrial disk, sandwiched between water and water. If there had to be a description of the world at all, said the churchly fathers, this was quite good enough; but most shared the attitude of St. Basil, who asked in the fourth century, “Of what importance is it to know whether the Earth is a sphere, a cylinder, a disk, or a concave surface? What is of importance is to know how I should conduct myself towards myself, towards my fellow man, and towards God.”

A few Christian philosophers succumbed to the temptation to embroider and embellish the permissible concepts of this epoch of institutionally exalted nonsense. A sixth-century monk, Cosmas of Alexandria, produced a bizarre work called *Christian Topography* in which he described the universe as a huge box having a curved lid, with a partition across the middle of the box to divide it into upper and lower sections. This is the “firmament” of Genesis. It serves as the floor for the upper section, which is heaven, and as the ceiling of the lower section, which is man’s world. The sun, moon, and stars are carried by angels just below the ceiling of the lower section. The Earth lies at the bottom of the box, not flat, but slanting sharply upward from the south and east so that the sun can go down each night in the west. At the northwest corner rises a great mountain behind which the sun disappears at nightfall. One lengthy section of the work is devoted to proving that the sun is small enough to fit entirely behind this mountain.

What makes all this shameful rather than merely
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quaint is that Cosmas had himself been a mariner, nicknamed *Indicopleustes*, “the Indian traveler.” He had visited India, Ceylon, and Ethiopia; but in his long voyages over the Indian Ocean he had learned nothing of the world about him, though he had been privileged to see more of it than most men of his time.

It is wrong, though, to assume that the medievals were unreconstructed flat-Earthers until Columbus dramatically shattered their fantasy. The flat-Earth hypothesis won general support among the Christian fathers no earlier than the fifth century A.D., was under serious attack by the seventh, and had fairly well been abandoned except by the ignorant and the reactionary before the end of the period we call the Dark Ages. Certainly by Columbus’ time, at least three centuries had passed since any reputable scholar had upheld the churchly cosmology.

Even those Christians who accepted the idea of a spherical Earth tended to incline toward Aristotle’s old concept of a single continent, though this was purely a coincidence, since Aristotle went unread in Europe until the twelfth century. The Scriptures declared, “Thus saith the Lord, This is Jerusalem: I have set her in the midst of the nations and countries that are round about.” Thus Jerusalem had to be the central point of the whole Earth, and in the early Christian era a pillar was erected in the holy city to mark the fact. If there were other continents beyond the sea, could Jerusalem still be said to have a central location? The notion seemed unappealing. In any event, if other continents lay beyond the tropics, they could in no circumstance be habitable. St. Augustine, who was no flat-Earther, had sharply attacked “the fable, that there are antipodes—that is to say, that on the opposite side of the Earth, where the sun rises when he sets to us, men plant their footsteps opposite to our feet—it is by no means to be believed.” There had been only one human
creation, had there not? How, then, could mortal men have crossed the uncrossable tropics to reach the supposed lands of the southern hemisphere?

Quietly the Greek geographical ideas reasserted themselves. At the beginning of the seventh century Isidore of Seville assembled an omnibus of the arts and sciences in twenty sections, which included some cogent views from the writers of antiquity. St. Isidore’s book, *Etymologies*, remained the basic source for geographers for several centuries, and helped to disseminate the concept of a spherical world, though it seems that Isidore himself tended to the orthodox churchly view. No ambiguities at all surround the teachings of the Venerable Bede, that learned English churchman of the eighth century who fully accepted the Earth’s sphericity. Casting aside the picture of a one-continent world with Jerusalem at its center, Bede revived the ancient five-zone theory of geography: a northern zone, “uninhabitable by reason of cold”; a temperate zone; a tropic, “torrid and uninhabitable”; a southern temperate zone, habitable; and finally “the austral [southern] zone around the southern turning point [the south pole] which is covered with land and is uninhabitable by reason of the cold.”

This was the intelligent speculation of an armchair geographer; but meanwhile other men, unfettered by Christian prejudices, were going to sea and making significant discoveries. They were Arab Moslems, propelled by the astonishing impetus of their religion’s dynamic founder. While carrying Islam to the far regions of the Earth, they became not only sword-bearing missionaries, but also mariners, geographers, and scientists. During Bede’s lifetime Arab sailors reached the coast of China, and soon there were regular voyages between the ports of the Persian Gulf and such international depots as Canton. China had been in contact with Western nations previously, for several centuries
beginning about 100 B.C. But that had been strictly an over-
land connection by caravan westward out of China along
the line of the Great Wall through Central Asia, and it had
ended by A.D. 200 with the decline of Rome and the virtually
simultaneous collapse of China's great Han Dynasty. The
Arab-Chinese sea trade of the eighth century and afterward
led to a marvelous flowering of both cultures through cross-
fertilization; Chinese junks now called at the ports of the
Bay of Bengal, the Arabian Sea, and the Persian Gulf, and
Arab ships, ever more skillfully managed, were common in
the South China Sea. Vessels in both directions circulated
through the harbors of the Malay Peninsula and the Indo-
nesian islands, since these lay like buoys across the water
between China and the Moslem west.

This Arab seafaring produced major changes in the
design of sailing ships and in the techniques of navigation.
During Greek and Roman times the special conditions of
Mediterranean shipping had exerted a negative influence on
the evolution of seacraft. The Mediterranean is tideless
and is relatively free from rough weather, and the abundance
of good ports made it possible to travel in a series of short
hops, rarely losing sight of land. Mycenaeans of Homer's
day had already arrived at a satisfactory vessel for such a
sea, and the Phoenicians, Greeks, Carthaginians, and Ro-
mans who followed merely elaborated on the basic model
without making fundamental changes. In classical times the
Romans built large, unwieldy cargo vessels, slow and heavily
timbered, which used square sails; these were good enough
for hauling grain about the Mediterranean but had little of
the maneuverability needed for voyages in the open sea.
Roman ships of war were much lighter and were propelled
by oars; they were speedy and maneuverable, but their range
was held down by the limitations of human brawn. Galley
slaves could not take a ship across an ocean.
The Longest Voyage

The chief Arab contribution was the versatile lateen sail. This triangular sail, probably an Arab invention though also known to the Polynesian seafarers, is laced to a long yard hoisted obliquely to a forward-raked mast. Unlike the clumsy square-rigged sail of the Romans, the lateen sail permits swift adjustment to meet a variety of wind conditions; a ship under lateen rig can sail closer to the wind—that is, make use of breezes even when they happen not to be blowing in the direction the ship is supposed to be going—and can cope with sudden changes in wind direction. Though it has disadvantages, mainly in the limit it places on the size of a vessel, the lateen rig made it feasible for the Arabs to challenge the open waters of the Indian Ocean with great success.

Of course they needed to find their bearings. We know from the account of Pytheas’ voyage that the Greeks had rough but serviceable ways of calculating latitudes, and that they were able to guess at longitudes. To find latitude they measured the height of the sun at noon; for longitude, they employed an involved method of computing by comparing observations made at two different points of the time of a lunar eclipse. This was hardly feasible aboard a ship, and so ancient seamen worked on a dead-reckoning basis most of the time, trying to keep track of longitude by totaling the distance covered from the home port. It rarely worked well, but that was not of immense concern in the Mediterranean, where a seaman could discover his longitude simply by putting in at the nearest port and asking where he was.

Arab skippers guided themselves with a variety of devices borrowed from landside astronomers. One of the first was the kamal, a series of small wooden boards, each representing a specific altitude, strung on a cord. The navigator, gripping the end of the cord between his teeth, drew it taut and placed the boards against the sky, lining up the polestar

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or some other heavenly body with a particular altitude-board. The height of the guide star above the horizon gave him his latitude. A simpler and more reliable form of this instrument was the cross-staff, a rod three or four feet long with a sliding crosspiece; holding it upright, the navigator squinted at his guide star through an opening, and moved the crosspiece to determine the star’s altitude. The astrolabe and the quadrant, more complex devices working on the same principle of visual sighting, were perfected by the Arabs by the thirteenth or fourteenth century. Thus they coped with latitude. Longitude was more of a puzzle for them, but solving it was not urgent for Indian Ocean navigation. The one instrument that the Arabs made little use of was the magnetic compass, an invention of their Chinese friends; it seems to have come to them from China by way of Europe rather than by direct transmission, and during their greatest seafaring years they got along without it quite satisfactorily.

Thus pursuing geography with such ardor, the Arabs came to know the world well while Europeans still engaged in pious speculations. The Arabs had no fear of the supposedly burning tropics and sailed far south down Africa’s eastern coast, at least to Zanzibar and probably well beyond. To the east they went as far as the South China Sea; possibly they ventured on occasion past the wall of islands, Philippine and Indonesian, that separates that sea from the Pacific Ocean, but they could not have entered the Pacific often or gone very deeply into it. They called it “the Sea of Darkness” and spun fables about it. The twelfth-century Arab geographer al-Edrisi wrote, “No one has been able to verify anything concerning it, on account of its difficult and perilous navigation, its great obscurity, its profound depth and frequent tempests; through fear of its mighty fishes and its haughty winds; yet there are many islands in it, some peopled, others uninhabited. There is no mariner who dares
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to enter into its deep waters; or, if any have done so, they have merely kept along its coasts, fearful of departing from them. The waves of this ocean, although they roll as high as mountains, yet maintain themselves without breaking; for if they broke, it would be impossible for a ship to plough them.”

At least the Arabs knew the Pacific was there. Europe remained locked in ignorance. Some of the new nautical skills of Islam filtered into Europe through that remarkable funnel, Byzantium, where Orient and Occident met; but though lateen sails appeared on Byzantine ships in the eastern Mediterranean by the ninth century A.D., western Europe remained a region of timid landlubbers who if they went to sea at all stayed close to home. Conspicuous exceptions were the Norsemen, who built a series of stepping-stones that took them all the way across the Atlantic: to Iceland by A.D. 870, to Greenland about a century later, and, beyond much doubt, to North America by the year 1000. Of their navigational methods little is known; they evidently relied on keen observation, intuition, and courage, and in any event were never very far from land, for their route lay around the northern edges of the Atlantic rather than straight through its heart.

Aside from the Vikings, Europeans had no firsthand experience with the outer world until the beginning of the Crusades at the end of the eleventh century, and even the Crusaders went no farther than the eastern end of that familiar lake, the Mediterranean. So the learned theorists, working by guesswork, divine inspiration, and echoes out of Byzantium, continued to construct images of the world in their land-bound studies. The Crusaders brought home news of the Arab discoveries and also manuscripts of Arab translations of Greek scientific works. The Arabs had made a specialty of finding and translating into their own tongue the forgotten works of Aristotle, Ptolemy, and the other great men of antiquity; these now began to seep into Europe.
Ptolemy became available again when the monk Gerardus of Cremona translated him from Arabic to Latin in 1175. Euclid, Archimedes, the many volumes of Aristotle—all these came by way of Islam and created a revolution in Europe’s long-stagnant intellectual life.

Thus William of Conches, in the middle of the twelfth century, argued mathematically for a spherical Earth. If the world were flat, he said, it would be day at the same time everywhere, which is not the case. Certain stars are visible in one latitude and not another, indicating curvature of the planet. His contemporary, Lambert of Saint-Omer, agreed that the world was round and revived the Ptolemaic notion of Terra Australis Incognita, an antipodal continent, “temperate in climate but unknown to the sons of Adam, having nothing which is related to our race. . . . When we are scorched with heat [the Antipodes] are chilled with cold; and the northern stars which we are permitted to discern are entirely hidden from them.” John of Holywood, in the thirteenth century, adapted Arab ideas to prove the roundness of the Earth by the difference in the time of eclipses between places in the east and in the west; his great contemporaries Albertus Magnus and Roger Bacon, accepting the spherical Earth without question, devoted attention to the problem of the southern hemisphere and concluded that it must be habitable. Albertus, writing about 1260, even declared that the torrid zone was peopled, a fact that the Arabs had already removed from the realm of speculation so far as they were concerned.

Despite this rush of new thought, European seafaring remained almost entirely confined to the Mediterranean; even the Vikings went no more a-roving by the fourteenth century. The Italian cities—first Amalfi and Pisa, then Genoa and Venice—replaced Byzantium as the chief maritime powers; the magnetic compass came into use; charts and maps ap-

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peared; ship design improved vastly as clever combinations of lateen and square rig were devised; and still no Europeans left their safe inland sea. The most famous of medieval travelers, Marco Polo, reached China by land, taking the old silk road of Han Dynasty days.

Marco's journey was made possible by grace of the Mongol conquerors of Asia who under Genghis Khan had come spilling out of their bleak steppes to batter at the gates of Europe. By the middle of the thirteenth century the Mongols controlled the largest empire the world had ever known, encompassing everything from Russia and Persia to the Chinese coast. With a single family ruling—surprisingly well—the vast region from the Mediterranean to the South China Sea, the overland route from Europe to China became safe and accessible to travelers, and contact between the two continents was restored after a lapse of centuries. The Polo family had two predecessors, a pair of astonishing monks named John of Plano Carpini and William of Rubruck, who made successive journeys to the Mongol domain in 1245 and 1253 respectively. Marco's father and uncle were next, arriving at the court of Kublai Khan in 1265; they had not meant to go to China, but only to Mongol-occupied Russia, and made the long trek eastward when a quarrel between two grandsons of Genghis Khan disturbed the western part of the Mongol empire and cut off their homeward route. They returned to their native Venice in 1269 and set out for China again two years later, this time accompanied by seventeen-year-old Marco. Arriving at Kublai's capital of Shang-tu or Xanadu, just north of the Great Wall, they received a warm welcome and remained in positions of high trust in Mongol-held China until 1292. During those years Marco attained important responsibilities in Kublai's government and traveled from Tibet to Burma. He was the first European to have any knowledge of the great ocean that lies east of China. He
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did not see the Pacific proper, only its westernmost limb, the South China Sea; but he brought back tales of its wonders that had a good deal to do with shaping the future course of world history.

For Marco told of the splendor of the spice-rich, gold-rich islands of that sea; it contained, he said, "no fewer than seven thousand four hundred islands, mostly inhabited." He spoke of the island of Cipangu—Japan—east of China, "rich in gold, pearls, and gems; the temples and palaces are roofed with solid gold." On their homeward journey from China the Polos went by sea as far as Persia and saw Java and the other Indonesian islands; there Marco heard of another golden kingdom nearby, known as Locach, and the readers of his book misinterpreted an ambiguous passage and placed Locach south of Java, regarding it as the Terra Australis Incognita. Thus, with the best of intentions, Marco became a snare for ambitious voyagers. Columbus, who knew Marco's book well, persuaded himself that Cipangu and the shores of Cathay—China—lay only a short distance west of Spain, washed by the familiar Atlantic; and later travelers searched south of Java for the glittering phantom of Locach.

The trade between East and West in the days of the Mongols was rich and fabulous. By caravan out of China came silks and incense, gems, spices, jade. At the western end of the trade routes, in the Levant and along the Black Sea, enterprising Italian merchants following in the tradition of the Polos established depots where Oriental goods were received and shipped on, via the Mediterranean, to the cities of Europe. Strange and gaudy new delights reached Paris and London and Rome: rhubarb and emeralds, rubies and pepper, sapphires, ivory, cinnamon, dyes, perfumes.

With the collapse of the Mongol empire in the middle
of the fourteenth century, contact between Europe and eastern Asia again was lost. The xenophobic Ming Dynasty rulers shrouded China in a bamboo curtain. Central Asia dissolved in anarchy, making the caravan route to the Orient unsafe. The last grip of the Crusaders on the Near East was dislodged, and now the increasingly more menacing Turks, replacing the Arabs as Islam's chief standard-bearers, sealed the eastern end of the Mediterranean as they encroached on tottering Byzantium.

Though European merchants could no longer go far into Asia, the export of Oriental goods persisted. Chinese and Persian silks still came overland to Tabriz and Trebizond, and on to Byzantium for distribution to Europe; jewels and ivory and jade still trickled westward somehow. But the most important, and thus the most carefully organized, of the commercial links between East and West was the spice trade. "Spice," to the medievals, meant many things: not merely condiments for seasoning and preserving foods, but also dyes, drugs, perfumes, cosmetics, and other exotic goods. Francesco Pegolotti, a Florentine merchant of the fourteenth century whose handbook on Oriental trade was indispensable to his contemporaries, compiled a list of 288 "spices," including eleven kinds of sugar, a variety of waxes and gums, and even glue. The core of the spice trade lay in true spices, however: pepper, nutmeg, mace, cinnamon, and cloves.

Europe, with its botanical sparseness, depended wholly on the fertile tropics for these delights. The craze for spices grew so intense that moralists assailed it, protesting, as did the early sixteenth-century scholar Ulrich von Hutten, that Europeans had become "slaves to their stomachs." Hutten, looking testily at such fads as mixing sugar and pepper to sprinkle on toast, declared: "I wish to mention the life of my grandfather, Lorenz Hutten, as a glowing example of a
simple life. He was a rich man and held the highest offices in both the civil and military services. But pepper, ginger, saffron, and other foreign spices never crossed his threshold, and he only wore coats of German wool.”

Spices were much more than fads for the flighty, though. They were necessities for medieval Europe. Lacking fodder to see their livestock through the winter, European farmers slaughtered most meat animals as the cold weather approached. This produced a great surplus of meat in autumn, which had to be consumed gradually over the long winter months. The rich could experiment with ice cellars, but most people made do with smoked or pickled meat for seven or eight months of the year. Spices were essential to cure and preserve the stored meat; spices also disguised the flavor of the meat as it spoiled. Pepper, the master spice, was most useful, and Europe’s appetite for pepper was insatiable, but cloves and cinnamon and nutmeg were also highly prized, and harder to obtain.

An elaborate mercantile chain brought these spices to Europe in the fourteenth and fifteenth centuries. The raw materials came from countries at the eastern edge of the known world—that is to say, from countries bordering on the Pacific Ocean. Cloves grew only in the Moluccas, the original Spice Islands: five small isles, Tidore, Motir, Makian, Bachan, and Ternate, clustered about a much larger island, Gilolo, or Halmahera, on which the peoples of the other five depended for their food supply. Nutmeg and its allied spice, mace, originated in the Banda Islands; other important spices came from the Amboina group. All of these islands are now included in the Republic of Indonesia. The source of cinnamon was Ceylon; pepper, the fruit of *Piper nigrum*, grew in western India, but the choicest came from the Indonesian island of Sumatra. (White and black pepper were made from the same plant; if the shell was left on while
the berries were being dried in the sun, black pepper was produced, and the milder white pepper was obtained by removing the shell before drying.)

The berries, nuts, roots, leaves, and pieces of bark from which spices were made were gathered cheaply by humble native laborers in the islands. Chinese and Malayan merchants made regular tours of these islands, collecting the baled produce and carrying it to the great port of Malacca near the tip of the Malay Peninsula. On this voyage the cargoes received their first thinning at the hands of the Chinese and Malay pirates who infested the Java Sea. Whatever spices got through to Malacca were sold at good profits to Hindu traders from India after the Sultan of Malacca had collected his heavy customs duties. The Hindus shipped their merchandise across the Bay of Bengal through a second gauntlet of Malay pirates, and realized their profits in the ports of India's Malabar Coast—Calicut, Cochin, Cannanore, and Goa. Arab merchants were the next purchasers. Loading their vessels with precious cargoes, they set sail for Persia, Arabia, or East Africa, traveling in convoys to escape the depredations of Indian buccaneers.

From the Indian Ocean to the Mediterranean there were many possible routes of access. One was via the Red Sea; the cargo could be landed at the Ethiopian port of Massawa and fetched inland by caravan to Egypt, thence up the Nile to Alexandria. Another Red Sea route necessitated transferring the cargo at the Gulf of Aden; the spices were taken from the big ocean-going ships and placed aboard small Egyptian coasting vessels that threaded the hazardous path to Suez, the harbor for Cairo and the Nile delta. An alternate route, via Jidda in Arabia, required a lengthy desert trek to Syria. Or the Red Sea could be avoided altogether and the spices taken up the Persian Gulf to Ormuz, and by the Euphrates to Baghdad, and from there to Aleppo or Damas-
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cus or Beirut. One way or another, the valuable goods at last reached the ports of the eastern Mediterranean. Now for the first time they passed into Christian hands. Italians, mostly Venetians, collected the spices from Byzantium, Alexandria, Antioch, Tripoli, or Beirut. Though relations between Christians and Moslems were bitter in the late Middle Ages, these pragmatic merchants were shrewd in their ability to maintain their trading concessions in hostile cities. They paid for the spices with Europe's woolen and linen textiles, with arms and armor, with copper, lead, and tin from European mines, with amber, and with gold and silver bullion; they also did a retail trade in slaves from the Caucasus and coral from the depths of their own Mediterranean.

To Venice and Genoa, at last, came the harvest of Asia—mainly to Venice. Dealers in spices crowded the Rialto to buy what the spice fleets brought. The markups were immense—since the goods reaching Venice had survived the repeated raids of pirates—and not only reflected the built-in profits of countless middlemen but also bore the burden of all the steep duties and taxes exacted by princes along the route. A bale of dried leaves purchased for a ducat in Ternate or Amboina sold for a hundred ducats in Venice. Then came the final distribution from Venice to the ultimate recipients all over Europe, and one final round of profit before the pickling and preserving could begin.

The canny Genoese and Venetians knew quite well how the world was shaped, at least that part of the world along which their spices were shipped. They even made a few tentative ventures beyond their immediate Mediterranean world. From bases in North Africa they penetrated the Sahara and got into black Africa as far as Timbuktu; they went up the Nile into the Sudan; they even peered into the Atlantic, which except for the Viking ships of A.D. 1000 had seen few vessels. In 1291 the Genoese brothers Guido and
Ugolino Vivaldo, guessing that they might reach India by sailing around Africa, went boldly off into the Atlantic and were never heard from again. Other Genoese two or three generations later, their names lost to us, discovered Madeira and the Azores, necessary island outposts in any Atlantic exploration. But these were isolated instances. Well into the fifteenth century, Europe stayed locked in geographical ignorance, deluded by inherited myths. To seek the Indies by way of Africa seemed hopeless, for the burning tropics blocked the path; and, in any case, what of Ptolemy's *Terra Australis*, making the Indian Ocean a landlocked sea? The maps of the unexplored regions were thick with legendary monsters and dragons, which terrified the innocent as effectively as considerations of high commercial risk terrified the clever.

These medieval geographical delusions—and a fair amount of sensible geography as well—were most attractively expressed in the remarkable work *Travels of Sir John Mandeville*, written about 1370. This purported to be the memoir of an authentic traveler but actually was a compilation of other men's writings, liberally padded with fantasies dating to classical times. "In a certain isle toward the south," Mandeville declared, "dwell folk of foul stature and of cursed kind that have no heads, and their eyes be in their shoulders. . . . And in another isle be folk of foul fashion and shape that have the lip above the mouth so great that when they sleep in the sun, they cover all the face with that lip." Amid the lively portraits of monstrosities and chimeras, though, was an intelligent discussion of the sphericity of the Earth and the possibility of a voyage of circumnavigation. Noting the fact that the constellations of the northern hemisphere were different from those visible in that part of the southern hemisphere known to Europeans, Mandeville declared: "Men may well perceive that the land and the sea be of
round shape and form, for the part of the firmament that showeth in one country, showeth not in another country. And men may well prove by experience and subtle compassment of wit that if a man found passages by ships that would go to search the world, men might go by ship all about the world above and beneath. . . ."

Early in the fifteenth century the learned Cardinal Pierre d'Ailly (1350-1420) codified most existing knowledge of the world, hypothetical and factual, into a series of valuable treatises. He had ransacked the works of antiquity—Aristotle, Ptolemy, Pliny—as well as the Arab writings of more recent times; reconciling their differences, rejecting discrepancies and improbabilities, he produced a shrewd, judicious image of the world. His essays—the *Imago Mundi* of 1410 and the *Compendium Cosmographiae* of 1413—circulated widely in manuscript all during the century and finally were printed at Louvain about 1480; Christopher Columbus owned a copy of the published volume, and it still exists in a library at Seville, its margins crammed with comments in the explorer's hand.

D'Ailly was both the last of the medievals and the first of the modern geographers. He was capable of writing such things as, "At the Poles there live great ghosts and ferocious beasts, the enemies of man. Water abounds there, because those places are cold, and cold multiplies vapors." But he also declared plainly, "The earth is spherical, and the western ocean is relatively small." Discarding Ptolemy's idea of a landlocked Indian Ocean, d'Ailly used other classical authorities to bolster his belief in a short westward passage by sea to Asia. "The west coast of Africa cannot be far removed from the east coast of India," he wrote, following Aristotle, "for in both those countries elephants are found." In another place he repeated the Aristotelian assertion that "the extent of sea is small between the coast of Spain in the West and
the shores of India in the East.” And he added, “Pliny
teaches us that ships from the Gulf of Arabia can arrive in
a short time at Gades [Cádiz] in the south of Spain.” D’Ailly
adopted the pre-Ptolemaic belief that one could go either
way to the Indies: eastward around Africa, or westward
across the unknown sea. Neither burning tropics nor an
obstinate southern continent would block mariners. Colum-
bus, when his time came to test d’Ailly’s ideas, chose the
westward route, but by then he had no option, for the east-
ward track was no longer a matter of theory. It had been
found, and it belonged to the Portuguese.

The era that one recent historian has aptly called the
“Age of Reconnaissance” was dawning in Europe as Cardi-
nal d’Ailly wrote. Why did the European discovery of the
world begin in the fifteenth century, one wonders, and not
in the third or sixth or twelfth? What mysterious signal was
given to usher in the epoch of maritime adventure? Actually,
a combination of forces—commercial, political, geographi-
cal, and technological—served to send Europe into that
frenzy of exploration that transformed the world. It was a
cumulative process, an accretion of necessary factors.

Global discovery was impossible without ships that
could survive in the open sea. In theory, a Phoenician or a
Roman galley might have reached the Americas, and per-
haps a few did; but the vessels used by the Mediterranean
seafaring nations were unsuited for Atlantic conditions, and
only the evolution of ships that were both sturdy and maneu-
verable made the long voyages worth attempting. The ex-
ploring impulse was not unknown prior to the fifteenth cen-
tury, but those rash men who sailed into the Atlantic did
not return.

The arts of navigation and cartography had to develop.
Each voyage had to build on previous knowledge, which meant there had to be ways of charting that knowledge, and ways of determining one’s position so charts could be followed. The Viking method of guesswork navigation would not do for systematic maritime exploitation; only after the nautical science of the Arabs—derived as it was from ancient Greece and Rome—began to seep into the Mediterranean was Europe ready to chance long journeys by sea.

A motive for voyaging, other than pure curiosity, was needed. The spice trade supplied it. Europe had become dependent on the treasures of the Indies; and the sources of those precious goods were in the hands of Europe’s enemies, the Moslems. Merely by courtesy of Islam did pepper and cloves trickle into Europe, and at any moment the trickle might be cut off by the whim of some distant sultan or pasha. With Turks and Arabs strangling the land routes to the Orient, there was good reason to seek the Indies by sea.

The Venetians and the Genoese, Europe’s dominant mariners in the early medieval period, were best equipped to undertake that quest, but they saw no point in tackling it. They had insinuated themselves into the terminal stations of the spice trade, and their positions seemed secure. So long as they could hop across the Mediterranean to Alexandria or Beirut to pick up cargoes of spices, why bother to look for a long way around? In the twelfth, thirteenth, and fourteenth centuries they were the only ones capable of making the attempt—but they lacked motive. So, while the necessary resources of navigation and shipbuilding and cartography accumulated, what remained missing was a nation hungry enough to want to steal the spice trade from the Italians and determined enough to accept the risks and costs of exploration. Such a nation did not emerge until the fifteenth century—the century of Portugal.

Portugal till then had been an unimportant strip of
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rocky coast on the Iberian Peninsula, an insignificant appendage to Spain. The Romans had given that coastal strip its name when they anchored their ships in its one good harbor at the mouth of the Douro river; they called their anchorage “Portus Cale,” “the hot harbor,” and the name came to include the entire coast. (The settlement at that harbor is known today as Oporto.) Before the Romans penetrated the Iberian Peninsula, the Carthaginians were there; if there is a genetic predisposition to the maritime life, those heirs of the Phoenicians transmitted it, making the Portuguese seafarers by first nature. Their small, poor country looks toward the sea anyway, with nothing behind it but bleak Spain, hostile through most of history and walling Portugal off from Europe. So the Portuguese went to sea, first as fishermen, then as merchants plying familiar routes to Brittany, Flanders, and England.

The country’s progress was hampered by war. For centuries there was the struggle against the Moors, who came out of North Africa in A.D. 711 to seize most of Spain and all of Portugal. Gradually the Moors were pushed out, but still Portugal had no independent existence, being merely a district of the Spanish kingdom of León, distinct only in its dialect. Through a long and intricate struggle, the Portuguese detached themselves from León in the twelfth century and preserved their independence through a series of shifting alliances with the numerous kingdoms and principalities of which Spain was then composed. The most important of these alliances, though a troubled one, was with Castile, the leading power of medieval Spain after the expulsion of the Moors.

During the fourteenth century Castile made several attempts to absorb Portugal; with English help, the Portuguese resisted invasion and managed to strike costly truces. The situation was complicated by intricate dynastic strug-
gles both in Portugal and in Castile. One claimant to the Castilian throne had murdered the other, who was the father-in-law of John of Gaunt, son of England’s King Edward III. John of Gaunt then claimed the throne of Castile himself and welcomed the Portuguese alliance as a way of unseating the usurper. Meanwhile, the Portuguese dynasty had become extinct in 1383, and the throne was claimed both by the King of Castile and by João of Aviz, the illegitimate half-brother of the late king.

John of Gaunt backed João of Aviz, to whom he was related by marriage. In 1385 the outnumbered Portuguese withstood a Castilian thrust and whipped the Spaniards decisively in the battle of Aljubarrota; soon afterward, João of Aviz became King João I of Portugal and cemented his English alliance by marrying Philippa of Lancaster, the daughter of John of Gaunt. The accession of the House of Aviz marked the birth of Portugal as a modern nation. With external enemies at last neutralized, the new dynasty was able to commence a policy of expansion and development. The Portuguese shipyards flourished; from Portugal’s harbors sailed flotillas of the squat, heavy, single-masted, square-rigged ships called naos, bringing cork, sardines, port wine, salt cod, and hides to England, and returning with wool, tin, and manufactured goods. The naos were awkward, stolid vessels that could take a great deal of punishment but whose usefulness was limited by their inability to tack—to move forward in a side wind or to sail into the wind. In favorable weather, a nao went forward; with the wind against it, it was helpless. But for the purpose of the trade with England, the naos served Portugal well.

João of Aviz looked to the south as well as to England. In 1411, when Portugal had arrived at an unaccustomed state of complete peace, he adopted Queen Philippa’s suggestion to maintain the momentum of the national economy
by sending an armed expedition to North Africa. João and Philippa envisioned a conquest of the Moorish kingdom of Fez, thereby reversing the Iberian calamity of 711 and opening the way for a Portuguese penetration, by land, of the supposed Christian kingdom of the fabled monarch Prester John somewhere in the heart of Africa. With Prester John’s cooperation, perhaps, a new spice route could be established, with caravans crossing Africa and bringing pepper and cloves to Lisbon.

João’s energies had failed him by then, and the queen herself organized the expedition, devoting three exhausting years to arranging the financing and assembling the arms, ships, and men. Her fierce determination to extend Portugal’s power into Africa must have been a family trait, for her brother Henry, operating under the same inner imperatives, had usurped the English throne a decade earlier to rule as Henry IV of Lancaster, and Henry IV’s son Prince Hal, destined for the throne himself in 1413, would in a few years launch his successful conquest of France. There was another Henry among Philippa’s five sons, Prince Henrique of Portugal, later called Prince Henry the Navigator, and he, along with his elder brothers Duarte and Pedro, helped his mother plan her war against the Moors.

Prince Henry, born in 1394, was three years younger than Duarte, two years younger than Pedro. All three were coming to manhood almost at once and welcomed the opportunity to meet the test of war. It took until 1415 to ready the expedition; by the summer, 45,000 men aboard 200 ships waited in harbor at Lisbon for the moment of departure. Philippa’s strength was nearly gone. She had spent herself entirely on the project, and her death weeks before the sailing of the armada turned the invasion into something of a sacred trust for her sons. The fleet sailed on July 25, with the old king and his three princes leading the campaign.
The inadequacies of the clumsy naos were revealed at once: as they headed south in the Atlantic, bound for the Moorish port of Ceuta, they were caught by a contrary wind and swept through the Straits of Gibraltar into the Mediterranean. This mishap had unexpectedly favorable consequences, for the defenders of Ceuta, seeing the Portuguese ships disappearing eastward, relaxed their vigilance and dismissed the reinforcements they had called up upon first learning of their danger. The Portuguese managed to swing a few of their heavy ships around by night when the wind changed, and, aided by oar-propelled galleys, descended in a surprise attack on Ceuta. The struggle was savage; at one point, Prince Henry was reported slain, though he was only wounded. But by nightfall the Portuguese flag flew over the citadel of Ceuta. Largely through Henry's valor, Portugal had taken the town known as "the key to the Mediterranean" and had begun the advance into Africa.

Queen Philippa's plan for reaching the Spice Islands through caravan routes across Africa came to nothing. Dislodging the Moors proved impossible, and even if it had not, beyond them lay the desert, and then the dark heart of the continent. Prince Henry swiftly grasped the truth: the way to the Indies lay around Africa, not across it. Though he made several more trips to fight in North Africa, he gradually withdrew from active campaigning to concentrate on geographical study that would lead toward attainment of that goal. In 1419 his father named him governor of the Algarve, Portugal's most southwesterly province, and the ascetic prince, who remained celibate and wore a hairshirt, established a center for research in that isolated region. On the promontory known as Cape Saint Vincent (at Sagres) he built a small town where he dwelled as a recluse, collecting information about the shape of the world and especially about the eastern Atlantic. He read the works of Arab
geographers, he conferred with travelers and merchants, he purchased maps and astronomical instruments—and he sent out expeditions of discovery.

Within a year Portugal had occupied the island of Madeira at Henry’s direction. From a map brought back from Venice by his brother Pedro he learned of the existence of the Azores and directed the rediscovery of those islands in the succeeding years. For these explorations, Henry scorned the lumbering *nao* in favor of lighter ships called *barcas*, which were nothing more than fishing boats with one big mast and a square sail, requiring a crew of about fourteen men. Later he used *barinels*, larger and longer vessels equipped with oars as well as sails, but even these did not give him the capabilities he sought. From 1440 on, Henry’s expeditions were usually made in *caravels*, ships carefully designed to meet the needs of explorers. The early Portuguese caravels were vessels of fifty to a hundred tons, with two or three masts and lateen sails. They were capable of advancing in a side wind and, to some extent, of tacking into the wind, and so were not compelled to await fair winds at sea.

Prince Henry himself never sailed with his caravels. His task was to learn and to impart, not to explore, and he remained at his observatory at Cape Saint Vincent, directing his grand enterprise at a distance. In his person was focused all the accumulated navigational wisdom of the centuries. He surrounded himself with astronomers and geographers from abroad; he pumped his returning captains for details of latitudes, currents, winds, coastlines; he worked to perfect the astrolabe, the quadrant, the compass, and other navigational instruments; and he added each newly gathered bit of information to his charts. Systematically he sent his ships farther and farther, from Madeira to the Azores, from the Azores south along the bulging hump of Africa’s western

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cost. His hardy little ships, with their mixed Arab and Mediterranean ancestry, underwent continual tinkering of design, and new combinations of sails, both lateen and square-rigged, came into use. The mariners grew more bold as they pierced deeper into the unknown. The dreaded burning tropics did not materialize even as they neared the equator, for the heat, while intense, was tolerable; but, discouragingly, there seemed to be no end to Africa. The interminable continent bulged farther to the west as Henry’s explorers continued their southerly cruises. Looking shoreward, they saw only the desert wastes of the Sahara; but then the terrain improved, and in 1441 inhabited lands appeared. Two of the Portuguese captains celebrated the fact by inaugurating the European slave trade, coming home with a cargo of blacks and providing an economic basis for Henry’s costly researches. Henceforth Portuguese caravels called frequently at the West African ports, where obliging native chiefs were ready to do business, offering elephant tusks, sacks of gold dust, hides, and slaves from villages in the interior. Prince Henry, a genuinely pious man, rejoiced at the opportunity thus gained to convert these enslaved Negroes to Christianity, while harder men in Lisbon agreed that the idealistic prince’s investment in maritime exploration had begun to pay excellent dividends.

In 1444 a landmark was reached: the rounding of Cape Verde, Africa’s westernmost point. Now the continent trended eastward, and the green and fertile lands south of Africa’s bulging hump were open to the Portuguese. On past the mouth of the Senegal, on past Sierra Leone and the Ivory Coast, on to Guinea the caravels sailed—and still more of Africa lay ahead. In dark moments, the aging Prince Henry may well have felt that Ptolemy’s guess had been correct, and that the land stretched to the South Pole, permitting no access by sea to the Indian Ocean.

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Still the geographer-prince sought his goal. The eastward trend of the land inspired hope. His researches produced a better southward route: instead of clinging to the North African shore, with its reefs and sandbars, the caravels now swung wide of the coast, far out into the Atlantic to catch favorable winds that sped them toward the slave ports. But the love of exploration for its own sake, never too strong in Henry's countrymen, seemed to be dying; most of the voyages now halted in known lands, and the southward impetus faltered.

Prince Henry had never forgotten his early vow to his dying mother to prosecute the war against the Moors. In 1458, when he was in his sixty-fourth year, he took part in another military campaign, fighting bravely and well in the capture of Alcacer, near Ceuta. But this adventure placed too great a strain on his resources, both physical and financial. In 1459, clearly a dying man, Henry was forced to send his nephew to Florence to arrange a loan for payment of his heavy debts. He offered as collateral, among other things, a patent of monopoly of the eastward sea trade to India, granted him a few years earlier by the pope. The Florentine bankers, skeptical of the worth of this asset, requested an opinion from a celebrated geographer, Paolo Toscanelli. He did not entirely rule out the possibility that India could be reached via Africa, but he felt that the fastest way to reach the Indies by sea was to sail westward across the Atlantic. Toscanelli cited the Viking voyages, and also the evidence of Marco Polo's book, which led him to think that the eastern limb of Asia extended far into the sea, terminating only a short distance west of Europe.

Much later, Toscanelli would express these ideas in a lengthy correspondence with a young Genoese named Columbus and would help to inspire a notable voyage. Now, though, he created confusion. Prince Henry still clung to the
eastward route; but when he died in 1460, with the sea route to the Indies still unattained, younger men captivated by the Toscanelli theory tried to send caravels westward. The season and the wind were against them; the westward expeditions came to nothing, and for nearly a decade Portuguese exploration halted altogether. Only the slaving voyages to Africa's by now familiar western coast continued.

Prince Henry had supplied tremendous thrust, though, for continued discovery. The profits of West Africa were immense enough, but they were nothing compared with the yield to be had by reaching the Indies. In 1469 King Afonso V—the son of Henry's brother Duarte—awarded African trading rights to one Fernão Gomes of Lisbon in return for Gomes' promise to discover a hundred leagues of coast a year. The details of Gomes' voyages were kept secret, to discourage the ships of other nations, but their results were notable in both gold and geography. By 1472 the Portuguese were in the Cameroons; the following year they crossed the equator for the first time. A depressing factor had emerged, however: the coast of Africa, which had trended eastward for hundreds of miles from Cape Verde, was now clearly running southward again, putting what seemed to be an unending obstacle between the Portuguese and India.

When the Gomes concession expired in 1474, King Afonso awarded exploration rights to his own son, João, a man who had some of the questing spirit of his great-uncle, Henry the Navigator. The young prince's plans were curtailed between 1475 and 1479 by war between Portugal and Castile, arising once more out of dynastic conflicts. King Afonso had married the niece of the King of Castile and, through her, claimed the Castilian throne upon that king's death; but the crown went instead to the late king's sister, young Isabella. It was a family feud, for both Isabella and Afonso V were grandchildren of King João I of Portugal;
but it was also a bitter struggle between newly prosperous Portugal and her powerful Iberian neighbor, Castile, for the African trade route. Isabella encouraged her subjects to engage in the African trade and to intercept homeward-bound Portuguese ships. Portugal countered by destroying the Spanish vessels bound for Guinea. The war thus was fought on two fronts; at home, the Portuguese were badly beaten and had to renounce their claims to the throne of Castile, but overseas, they maintained their dominant position. By the Treaty of Alcaçovas, which ended the war in 1479, Castile conceded to Portugal a monopoly of fishing, trade, and navigation along the entire West African coast. It was the first stage in the staking of Spanish and Portuguese spheres of influence abroad.

Freed of the burden of this war, Prince João was able to pursue an energetic expansionist policy when he came to the Portuguese throne as João II in 1481. He built Portuguese fortresses on the Guinea coast, sent ambassadors to Ethiopia to confer with Prester John, and revived Prince Henry's practice of encouraging advances in the science and art of navigation. A pair of Jewish astronomers, Joseph Vizinho and Abraham Zacuto, calculated elaborate and extremely valuable tables for finding positions at sea; improvements were made in the design of caravels; new charts were drawn.

Once again, for the first time in more than twenty years, expeditions went forth in caravels equipped only for exploration, not for trade. João II, not a patient man, wanted the sea route to India found swiftly, and he urged his captains southward eagerly and aggressively, reacting with poor grace when they returned to tell him that still more of Africa kept them from turning east. In 1483 Diogo Cão reached the mouth of the Congo, explored the river to some extent, and continued along the coast to 13°S. before turning back. King João knighted him and gave him a pension, but almost im-
mediately sent him on a second voyage. This time he got nearly to the Tropic of Capricorn, attaining 22°S. without finding the desired eastward route. The king was keenly disappointed when the Cão expedition returned to Lisbon in 1487 with no news of success. Cão, who had explored 1,450 miles of unknown coast, working against the current and the winds much of the time, disappeared from view, his career broken by his failure to find India. (One contemporary source says he died on the return voyage, another that he returned and was forced into retirement.)

Cão's successor, Bartholomeu Dias, brought the king happier tidings. Setting out in 1487, Dias traveled down the coast far beyond the most southerly point visited by Cão; after provisioning at Lüderitz in what is now South-West Africa, Dias' caravels were beset by storms and driven far into the Atlantic. On a great arc they swept around the Cape of Good Hope without sighting it, and by the time they could regain the coast, in the vicinity of Mossel Bay in the Union of South Africa, they had unwittingly crossed from the Atlantic to the Indian Ocean. This became only gradually apparent as the land trended eastward: Dias had amputated one great lobe of the vast supposed southern continent and had attained Africa's terminal point. The gateway to the Indies was open. But provisions were low and his men were exhausted by the rough weather; reluctantly Dias agreed to turn back. On the return voyage, the great southern cape came into view. He named it Cabo Tormentoso, "Cape of Storms"; but after Dias' arrival in Portugal at the end of 1488, King João rechristened it optimistically the Cape of Good Hope.

Much happened before that hope could be fulfilled. In March 1493 a battered little caravel called the Niña strug-
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gled into port at Lisbon. King João sent Bartholomeu Dias aboard to get an explanation of the ship's activities from her commander. That commander, a certain Italian named Columbus, readily admitted that he was in the employ of the Spaniards and that he had just completed a successful voyage to Asia by the westward route. Heavy seas and severe storms had assailed him on his way back, and so he had been compelled to stop first in the Azores, then at Lisbon. He asked leave to sail on now to Spain. Had he actually reached India or Cathay? No, Columbus replied, only the islands of the Indies. But he had no doubt that the Asian mainland lay nearby.

While Columbus continued on triumphantly to Spain, King João II contemplated the Genoese navigator's story with little pleasure. He knew, of course, of Columbus' theory, derived from Marco Polo and Toscanelli, that Asia could be reached by sailing westward. Columbus had explained all that to him in 1484 while he was in the Portuguese maritime service. The Italian had asked King João to finance a westward expedition. The king, though enthusiastic for exploration, was committed to the eastern route; he was at the moment tensely awaiting news of Diogo Cão's first voyage. Yet João submitted Columbus' plan to his councillors, who told him that the costs outweighed the possible benefits. After a careful hearing, Columbus' project was refused, and the Italian went off to sell his idea in Spain. In 1485 King João had a second thought and shrewdly, if none too honorably, mounted a Portuguese expedition to the west after all, under the command of Fernão Dulmo, a Portuguese from the Azores. Dulmo proposed to depart from the Azores, unaware that the prevailing winds in the North Atlantic blow from the west and would prevent such a voyage from being successful. Nothing came of it. Possibly Columbus, if he had sailed under Portuguese auspices, would have also
tried the northern crossing and ended in failure. But after long delays he had won Spanish backing, had caught the steady trade wind that blows westward past Madeira and the Canary Islands to the Caribbean, and had made his crossing. King João’s bitterness at being beaten to the Indies was compounded by the galling knowledge that he had let Columbus slip from his hands.

To make things worse, Columbus had found Asia for the Spaniards, with whom King João was having much trouble. After hundreds of years of fragmentation, the little Spanish kingdoms were suddenly united and posed a real menace for Portugal. The union had been taking shape since 1469, when Prince Ferdinand, heir to the throne of Aragon, married Princess Isabella, the heiress to the throne of Castile. Portugal’s attempt to displace Isabella in Castile had been disastrous, and from 1479 on, Ferdinand and Isabella ruled undisputed in their jointly held kingdoms. Gradually they had extended their grip over the rest of Spain, the climax coming in that memorable year of 1492 when Granada, the last stronghold of the Spanish Moors, was conquered. João’s Portugal now was neighbor to an uncomfortably strong nation undergoing a massive convulsion of reform and growth. Long landlocked, Spain was plainly envious of Portugal’s lucrative empire on the West African coast; if Columbus had given Ferdinand and Isabella the sea route to the Indies, it would be Spain and not Portugal that emerged now as the wealthiest maritime power of Europe.

King João had family problems, too—which, since he was a monarch, were therefore national problems. In 1490 he had engineered a magnificent coup by affiancing his only son, fifteen-year-old Prince Afonso, to the daughter of Ferdinand and Isabella. Thus the boy, though weak and effeminate, stood next in succession to all the crowns of the Iberian

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Peninsula, and Spain and Portugal would be united under his rule a generation hence. That bold dream was shattered within a year. In June 1491 Prince Afonso died under mysterious circumstances; the official story was that he was killed by a fall from his horse, but there were hints that he was slain by a disaffected branch of the royal family. King João's wife, who was also his cousin, belonged to that branch of the family, and so did her brother, Duke Manoel, who now became heir presumptive to the Portuguese throne.

Manoel, whose role in the death of Prince Afonso was never determined, feared King João's wrath. The duke placed himself under the protection of his sister, Queen Leonora, who had separated from the King after the death of their son. João's only hope of maintaining the succession for his own line lay in a young bastard son, George, on whom he now bestowed a dukedom, while seeking to have him legitimized by papal decree. But by 1493 it appeared inevitable that Manoel and not George would be Portugal's next king; with his dynasty destroyed and Spain in possession of Columbus' gift of Asia, João faced the future in bleak mood. In his desperation he resorted to a farfetched claim. Spain's patronage of Columbus, he said, was in violation of the Treaty of Alcaçovas and of various decrees of recent popes granting Portugal the exclusive right to explore the Indies. Columbus, said King João in the spring of 1493, had trespassed on Portuguese waters, for the isles of the Indies that he had found lay close to the Azores and might be considered part of that group. Therefore Portugal claimed ownership of whatever Columbus had discovered, citing as authority a bull, or decree, issued by Pope Martin V more than sixty years earlier, as well as bulls granted to Prince Henry the Navigator by Nicholas V in 1454 and Calixtus III in 1456, and most especially the bull *Aeterni Regis* issued by Pope Sixtus IV in 1481, confirming the
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terms of the Treaty of Alcaçovas. In a belligerent message João threatened war if Spain did not at once renounce her claims to Columbus’ discoveries, and announced that he was about to send a fleet of his own to take possession of the newly found western islands.

Ferdinand and Isabella, having just concluded their expensive, decade-long war against the Spanish Moors, did not judge themselves ready for conflict with Portugal, but they were not about to give up the Indies, either. Therefore they made a mild, conciliatory reply to João, which nevertheless reasserted their right to Atlantic exploration. All the treaties and bulls cited by Portugal, they argued, applied only to waters to the south and east of the Azores, not to the west. When King João continued to raise loud objections, Ferdinand and Isabella played their trump card. João wished to cite papal bulls? Very well, said the Spanish monarchs: they suggested that the dispute be referred to the current pope for arbitration. Was he not the highest earthly authority? Was he not an austere and impartial potentate? Was he not also Don Rodrigo Borgia, a Spaniard, a native of Ferdinand’s Aragon?

João was caught. He could not refuse the papal arbitration after his own reliance on the decrees of past popes. But the reigning Pope Alexander VI, who had been elevated to the throne of St. Peter on August 10, 1492, was that sinister and self-indulgent fantasy-figure of the Renaissance, the head of the House of Borgia, the father of Cesare and Lucrezia Borgia, the archetype of all corrupt popes, the owner of vast estates, the keeper of many mistresses, the friend of Spain. It was the Borgia pope who graciously consented to arbitrate the quarrel between Spain and Portugal.

The decree of Pope Alexander VI has been much misinterpreted as a document in which he bestowed all the undiscovered portions of the world on his two favorite chil-

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dren, Spain and Portugal. So it was regarded by other nations, particularly by England, which within half a century would come to reject the pope’s authority altogether. The English looked upon Pope Alexander’s decree as an abomination devised for the special benefit of Spain and Portugal; their attitude toward it is best seen in a fantastic and bombastic essay written early in the seventeenth century by the geographer Samuel Purchas, who said of Pope Alexander that he was heir of all his predecessors’ vices, “who having procreated many Bastards, procured the Papacy by Simony (some add, Diabolical Contracts) to advance them and himself, with unjust justice miserably plaguing those Simoniacal Cardinals, which for Price and Promise had exalted this Plague-sore into that Chair of Pestilence, where he acted the Monster of Men, or was indeed rather and incarnate Devil.” But in fact Pope Alexander’s decision was not so much a gift to Spain and Portugal together as it was a shameful stripping away of Portuguese privileges.

Ferdinand and Isabella had taken the precaution of getting a ruling from Alexander before making their open appeal to him. Spanish envoys went to the Spanish pope in Rome, told him the wishes of the Spanish king and queen, and came away with a series of bulls granted to Spain without the knowledge or consent of Portugal. The first of these, dated May 3, 1493, but issued in April, granted Spain authority over lands and islands discovered or afterwards to be discovered in the west toward the Indies in the Ocean Sea, as the Atlantic was called. This conflicted with the Treaty of Alcaçovas to some extent, for Columbus had shown that it was necessary to go south to get the trade winds before going west, and in the spring of 1493 he was about to depart on a second expedition following just that route. Obligingly, Pope Alexander gave Spain a second bull, dated May 4 but not released until June, granting the Span-
ish sovereigns the islands and continents in the south as well as in the west.

Seemingly, this deprived Portugal even of the African route so laboriously pioneered all during the fifteenth century. The pope clarified his wishes with a third bull, the famous *Inter Caetera*, again dated May 4 but actually issued in July. This document, which praised the valor of “our well beloved son Christopher Columbus,” repeated the assignment to Spain of all the lands and islands discovered or to be discovered to the west and south, but for the first time established a line of demarcation between the Spanish and Portuguese spheres of influence. The boundary, said the pope, would run from pole to pole along a line drawn one hundred leagues* west of the Azores and the Cape Verde Islands. What lay west of the line was open to Spanish exploitation; lands to the east were reserved to Portugal by implication, though there is no reference to Portugal in the text of the bull. “Let no person presume with rash boldness to contravene this our donation, decree, inhibition, and will,” thundered the pope. “For if any person presumes to do so, be it known to him that he will incur the indignation of Almighty God, and of the blessed apostles Peter and Paul.” A fourth bull, *Dudum Siquidem*, completed the series by revoking all previous papal grants to the Portuguese, again not mentioning Portugal but simply awarding Spain “all islands and mainlands whatever, found or to be found . . . in sailing or traveling towards the west and south, whether they be in regions occidental or meridional and oriental and of India.”

Armed with these four bulls, Ferdinand and Isabella were cheerfully willing to submit to papal arbitration of the Indies question. King João, aghast at the trap into which

* One league equals three miles; but the length of the mile varied widely from country to country in the fifteenth century.
he had fallen, sent an anguished protest to Rome when he learned the contents of the bulls. The pope, who was heavily obligated to the Spanish monarchs in many ways, showed no interest in changing his decrees, high-handed and one-sided though they were. It was not a bashful age, and the Borgia pope could serenely bestow the Orient upon Spain without a tremor of conscience. João, risking excommunication, resolved once more on war with Spain. But it was a war that neither side really desired, and he was quick to accept diplomatic overtures from Spain. With the little comedy of papal arbitration out of the way, Spain and Portugal settled down to serious negotiation. João now knew that he could not enforce his brazen claim to Columbus' western discoveries, and Ferdinand and Isabella were aware that they could not make João peacefully swallow the pope's even more brazen rulings.

Both sides agreed to accept the third bull, Inter Cae
tera, as the starting point for a deal. Spanish and Portuguese diplomats met at Tordesillas in 1494 to arrive at some more realistic line of demarcation than the one the pope had proposed. The pope's line ran too close to Africa for João's comfort; at Portuguese insistence, the line was moved, after some haggling, to a point 370 leagues west of the Cape Verde Islands—that is, well out in the Atlantic. Spanish ships would be permitted to sail through Portuguese waters on their way west to the Indies, and so gain access to the vital westerly trade winds; but the eastward route remained exclusive to Portugal. Thus João protected his valuable African interests. With the signing of the Treaty of Tordesillas on June 7, 1494, the division of the world was confirmed, and the threat of war between Spain and Portugal subsided.

King João II could feel some satisfaction over the outcome. To his chagrin, he had let Columbus give the western
route to Spain, but there was no way of undoing that; at least he still owned the eastern route. Bartholomeu Dias had proved in 1488 that Africa could be rounded. Meanwhile Pedro de Covilhão and Afonso de Paiva, João’s emissaries to Prester John, had successfully carried out their reconnaissance of the eastern end of the route to India. They had left Portugal—forever, as it turned out—in May 1487. By way of the Mediterranean they reached Egypt, where, after suffering disease and the loss of the merchandise they carried, they joined a party of Moorish merchants and sailed down the Red Sea to Aden. There, in the spring of 1488, they parted. Paiva went westward into Ethiopia to seek the legendary Christian monarch whom Europeans called Prester John, while Covilhão boarded an Arab vessel and voyaged to India. In a month he landed at the port of Cannanore, the first Portuguese to set foot in the fabled land of India. Journeying down the Malabar Coast, the resourceful Covilhão studied the workings of the spice trade, observing the activities of the Arab and Hindu merchants who brought the goods from the isles of the Indies and sold them here. He learned of commodity prices, prevailing winds, sources of supply, and much else during a stay in the Indian port of Calicut. Among his discoveries was the information that there was open sea beyond the southern tip of Africa, a fact that Bartholomeu Dias was independently learning at first hand about the same time. To confirm this news of a sea route around Africa, Covilhão left Calicut for Ormuz, the great mart on the Persian Gulf, and in 1489 headed by ship along the coast of Arabia to East Africa. He ventured as far as Sofala at 21°S., some two-thirds of the way down Africa’s eastern shore; Arab traders were busy there, and there could be no doubt of the existence of a seaway around Africa linking Europe to the Orient. He heard also of the large island of Madagascar and collected a wealth of data
about harbors and sailing conditions in this part of Africa that would be of immense value later. Finally, in 1490, Covilhão returned to Cairo, where he learned of the death of his colleague, Paiva. He found two Portuguese Jews sent by King João to look for him, and turned a report of his travels over to them before setting out on further adventures. The astonishing Covilhão now disguised himself as a Moslem and made the pilgrimage to Mecca, apparently to satisfy his own curiosity; then he fulfilled his instructions by entering Ethiopia and reaching the court of Prester John to see about the possibility of arranging a land route across Africa from Ethiopia's Red Sea ports to Portugal's outposts on the Atlantic. There his wanderings ended, for the Ethiopian monarch did not believe in letting foreigners return to their native lands, and Covilhão was still in the land of Prester John 30 years later when another Portuguese ambassador arrived.

By 1494, with the trouble with Spain over, King João was at last free to capitalize on the knowledge won for him so strenuously by Dias and Covilhão. There was a sea route to India; the names of ports along the way were known; all that remained was to send out an expedition to the Orient and open trade relations. João felt a sense of urgency about the enterprise, now that the Spaniards had access to Asia from the west. He did not want his Iberian rivals to gain control of the spice trade before his own ships arrived.

João did not live long enough to comprehend the irony of recent events. The joke was on Spain, for Columbus had not reached Asia at all, merely some puzzling islands inhabited by naked savages. No one knew how much farther it might be to the true Indies. And a few years later it became apparent that Columbus' route could not get Spain to Asia at all, because two colossal continents amazingly blocked the ocean. Portugal alone had access to the Indies,
via the east. But João died in 1495, only forty years old, perhaps a victim of poison, more likely carried off by dropsy or uremia. To Portugal's throne came Manoel the Fortunate, twenty-six years of age, handsome, ambitious, a good administrator, something of a miser, who would be the beneficiary of all the building the House of Aviz had done before him. In his reign the round world's imagined corners would be reached; Portugal would attain the empire in the Orient of which his ancestors had dreamed; and caravels laden with spices would stream toward Lisbon.

7

Manoel had none of Henry the Navigator's love of science, nor did he show João II's interest in exploration for its own sake. He was interested primarily in money and the power that could be derived from money. Though he did not treat his captains and courtiers generously—and ultimately his penuriousness would prove costly to him—Manoel spent huge sums to construct palaces, monasteries, churches, hospitals, and government buildings, and his extravagances in that respect nearly bankrupted his small country, which had a population of only about a million during its era of greatness. To meet his vaulting desires, Manoel needed an overseas empire. First India, then Egypt and Arabia, then all of Asia and Africa would have been incorporated into a Christian Portuguese domain if Manoel's dreams had been fulfilled.

First things first: India. When he came to power, he found an India-bound armada being constructed under the supervision of Bartholomeu Dias. Dias had earlier sailed in three-masted, lateen-rigged caravels, but these had given him trouble near Africa's windy tip, and to provide greater safety and comfort for the sailors on their long voyage to India, he was building two large old-fashioned, square-
rigged naos. In 1496, after helping to finance the expedition by expelling the Jews and Moors from Portugal and confiscating their capital and businesses, Manoel ordered the purchase of two smaller lateen-rigged caravels. Thus the India armada made use of all the resources of late fifteenth-century ship design, just as it employed the accumulated knowledge of the sea and winds that had been collected since the time of Henry the Navigator. Supreme command of the expedition went not to the veteran Dias, who accompanied the armada only as far as Guinea, but to a twenty-eight-year-old nobleman and diplomat, Vasco da Gama. His prior naval experience is unknown, but evidently he had already won some reputation at sea. Manoel's faith was justified, for Gama successfully carried out the finest feat of navigation ever achieved up to that time, Columbus' voyage included.

The four Portuguese vessels left Lisbon on July 8, 1497. Many of Gama's men had served in the Dias voyage; some had even been to sea with Diogo Cão. Favorable winds took them through familiar waters as they sailed between the Canaries and the African coast, called at the Cape Verde Islands, rounded the bulge of Guinea, and headed for the Cape of Good Hope. Swinging far out into the South Atlantic as he had learned from Dias to do, Gama spent thirteen weeks in the open sea, the longest passage European seamen had ever made out of sight of land. (Columbus sailed five weeks between the Canaries and the Bahamas.) At last turning east—a little too soon—the Portuguese made land on November 8 at the Saint Helena Bay, about 130 miles north of the Cape of Good Hope. For eight days they remained, tending to their ships and collecting wood and water; Gama was wounded by the javelin of an unfriendly Hottentot in a skirmish before their departure. Six days later they rounded the Cape and halted in Mossel Bay. De-
spite storms, contrary currents, and an attempted mutiny. Gama pushed onward beyond Dias’ farthest point, into the unknown. Now they turned north, up Africa’s eastern coast, calling at various ports. All went well until they reached Mozambique, the southern limit of the Moslem coastal domain. The Arab traders had long regarded this section of Africa’s Indian Ocean coast as their own property, and they were unenthusiastic about the arrival of Christian intruders; the Portuguese were driven out of Mozambique and the port of Mombasa, where Gama endured attack and sabotage for six days while trying to hire an experienced pilot to guide him to India.

Somehow the voyagers managed to obtain a warm greeting at the next port up the coast, Malindi, 2,500 miles north of Dias’ stopping point of 1488. They reached it at Easter-time and enjoyed a pleasant visit; Gama was able to acquire the services of a famous Moslem pilot, Ahmed ibn-Majid, an authority on the Indian Ocean who had written several geographical texts in Arabic, and who astonished Gama by his familiarity with the astrolabe and the cross-staff. Ahmed ibn-Majid guided the armada safely through the atolls of the Laccadive Islands to India. On May 20, 1498, Portuguese ships at last appeared in the harbor of Calicut. The long quest was at an end; the sea route to the Indies had truly been found.

The Malabar Coast of southern India was then divided into tiny city-states, each ruled by a local prince whose chief occupation was squabbling with his neighbors. The princes and most of their subjects were Hindus, but the commercial life of the ports, particularly the export trade, was controlled by Arabs and Moslem Indians who had no wish to see Europeans cut into their profitable spice business. Gama, as wise a diplomat as he was a navigator, found his abilities fully tested as he negotiated to break the Moslem monopoly.

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He approached the Zamorin of Calicut for permission to purchase spices, and that Hindu ruler was friendly at first; but he cooled toward the Portuguese when he saw how mean were the gifts that the thrifty King Manoel had sent to him. The Moslem merchants began to put pressure on the zamorin to refuse port facilities to the Portuguese, and, fearful of displeasing them, the zamorin yielded. Gama narrowly escaped assassination at the hands of the Moslems, and it was almost impossible for him to acquire spices. But he persisted, wheedling here and haggling there, and after three wearying months succeeded in obtaining a cargo of precious merchandise.

The return trip across the Indian Ocean was a dreadful one, taking another three months. Scurvy plagued the Portuguese so severely that, when they reached Malindi in January 1499, there were hardly enough crewmen to man the vessels. After a cheering respite at Malindi and an easy journey to the Cape of Good Hope, the explorers suffered again from the storms of the South Atlantic, and when Gama entered Lisbon the following September, he had only two of his four ships and had lost more than 100 of his 170 men. Yet the expedition was a triumph. In two years and two months he had covered 28,000 miles, he had found India, and he had returned with spices worth sixty times the cost of the voyage. King Manoel could not resist boasting of Gama’s great achievement in a smug letter to Ferdinand and Isabella, whose daughter he had recently married:

“. . . We learn that they did reach and discover India and other kingdoms and lordships bordering upon it; that they entered and navigated its seas, finding large cities, large edifices and rivers, and great populations, among whom is carried on all the trade in spices and precious stones. . . . Of these they have brought a quantity, includ-
ing cinnamon, cloves, ginger, nutmeg, and pepper, as well as other kinds, together with the boughs and leaves of the same; also many fine stones of sorts, such as rubies and others."

Manoel now began to style himself "Lord of Guinea and of the Conquests, Navigations, and Commerce of Ethiopia, Arabia, Persia, and India." To Manoel it was regrettable, though not really serious, that the merchants of Calicut had shown so little willingness to let Vasco da Gama do business there. Perhaps they could be persuaded to relent; if not, Portugal would simply have to conquer a few Indian ports and set up her own trade network to the Spice Islands. Certainly Manoel was not going to relinquish his great opportunity to establish Portugal as the premier seagoing nation of Europe. Within six months of Gama's return, King Manoel was ready to send out a second and far larger fleet, one that taxed little Portugal's resources to the utmost: 13 ships, 1,200 men.

Vasco da Gama stayed home this time, not because Manoel felt he deserved a rest so much as because it was Portuguese policy to keep the captains from growing too important. Diogo Cão had been cut down after his second great voyage; Bartholomeu Dias had played only a secondary role in Portuguese exploration since his grand accomplishment of 1488; and Gama now was quietly shunted aside for a while. The commander this time was another young aristocrat, Pedro Alvares Cabral. With him sailed old Bartholomeu Dias and many other veterans of earlier Portuguese expeditions. Leaving Lisbon on March 8, 1500, the great armada headed toward India by the traditional route, first south past the bulge of West Africa, then sweeping far west of Africa into the South Atlantic. Cabral swung a little too far to the west, or perhaps he was blown off course; in the

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latitude of 17°S. he unexpectedly impinged on the coast of Brazil before he could begin his eastward voyage around the Cape of Good Hope.

Europeans then were beginning only dimly to perceive the existence of the two American continents, and no one yet realized that they were continuous almost from the Arctic to the Antarctic. North America was known only by a bit of its northern coastline. In 1497 the Genoese seaman John Cabot, sponsored by Henry VII of England, had sailed northwest looking for a route to the Indies that did not fall into the Spanish sphere, and had encountered Newfoundland. Cabot thus became the first European since Viking days to reach North America and return to tell of it. King Manoel, always alert to opportunity, had allowed a Portuguese named Gaspar de Corte-Real to follow Cabot's track in 1500; Corte-Real rediscovered Greenland by sailing west from the Azores, reached Newfoundland, and deceived himself into thinking that the Gulf of St. Lawrence was a sea route clear to the Orient. He called it the Strait of Anian and thus helped to foster centuries of fruitless search for a northwest passage; both he and his brother Miguel were casualties of the quest for this passage within a few years.

Below Newfoundland, all was unknown for thousands of miles. Columbus had glimpsed the coast of Venezuela on his third voyage in 1498, though he was still convinced he was near India. In 1499 and 1500 several Spanish expeditions filled in the outline of the upper curve of the South American mainland; Vicente Yáñez Pinzón, a veteran of Columbus' first expedition, saw the coast of Brazil before Cabral, though he did not go ashore. Cabral, landing a few months later, demonstrated what Pinzón had quietly suspected: that South America bulged so far to the east that Brazil lay on the Portuguese side of the pope's line of demarcation. Though no one was quite certain where that line
really ran, owing to the practical difficulties of determining longitudes, it seemed certain that Brazil was east of it and that Portugal would thus have a piece of the New World after all.

But there were no Portuguese settlements in Brazil until 1531. The New World—which nearly everyone but Columbus knew by 1500 was not Asia—had so far yielded only a modest return for Spain, and Cabral was not inclined to linger there for long. He sent a ship back to Portugal to announce his discovery of territory on the South American mainland, and continued on to the known and reliable source of wealth, India. The Atlantic crossing was a difficult one; he lost four ships with all hands, and among those who perished was Bartholomeu Dias. Despite the Brazilian detour and the stormy voyage, the surviving vessels reached the coast of East Africa remarkably quickly; Cabral hired a pilot in Malindi and his ships were in India by the end of August 1500, only six months out from Lisbon.

He obtained an interview with the Zamorin of Calicut and, despite renewed opposition from the Moslem merchants, won permission to set up a Portuguese trading depot, or factory, in the town. The Moslems were angered by this and even more furious when Cabral captured one of their ships in order to obtain an elephant as a gift for the zamorin. They retaliated for this piracy by destroying the newly built factory and slaying fifty Portuguese. Cabral’s response was to burn ten Arab ships with their crews aboard, and to subject Calicut to a severe bombardment from sea—the beginning of Portugal’s war against the Moslem traders of India. Hope of arriving at a peaceful accommodation with the zamorin was dead at that point, so Cabral sailed south to the port of Cochin, long a rival of Calicut’s. The local ruler was cooperative, either out of a wish to get one up on the zamorin or simply out of fear of the Portuguese cannons;
he allowed Cabral to load spices at Cochin for two weeks. Then the Zamorin of Calicut, seeking revenge, appeared off Cochin with eight ships of his own. The Portuguese elected to withdraw, but they halted to buy more spices at the port of Cannanore north of Calicut before making their return voyage to Portugal. Cabral reached Lisbon in the summer of 1501. Only four caravels of his whole fleet came back, but they bore 2,000 hundredweight of pepper, 600 of cinnamon, and 400 of ginger, along with lesser quantities of cloves, lac, and benzoin.

Since Cabral had blundered into a war with Calicut, his voyage was hardly a diplomatic success, but as a commercial endeavor it gave King Manoel great delight. Lisbon's warehouses suddenly were rich with wondrous goods; bankers from Germany and Italy, sensing a new boom, were heading toward Portugal; and in Venice, Europe's spice emporium for more than a century, tremors of anxiety shook the countinghouses. Cabral's return, wrote a contemporary Venetian diarist, was a catastrophe, "the worst news the Venetian Republic could have had." A dramatic shift in the structure of the spice trade was about to occur.

The Portuguese could hardly have chosen a better time to reach India. Political confusions in the eastern Mediterranean had virtually cut off Venice's own spice importations, with a corresponding rise in commodity prices. In Egypt a governmental crisis beginning in 1496 had paralyzed trade and had compelled the spice bazaars of Cairo to suspend business. Venice and Turkey went to war in 1498 over control of the Dalmatian coast, and about the same time the French invaded Italy, creating more chaos. The links of the spice trade had snapped. Venice had, for the moment, lost access to Alexandria and Beirut, and by 1499 the price of pepper on the Rialto was 80 ducats per hundredweight, up from 42 ducats in 1496. Into this situation of strangled
supply came the Portuguese, who found themselves able now to buy pepper in India for three ducats the hundredweight. A Venetian envoy in Lisbon wrote his government after Cabral’s return, “They took on a heavy cargo . . . at a price I fear to tell.” Another Venetian observer estimated that the Portuguese could show a profit of a hundred ducats for every ducat invested, since their route to the Indies eliminated all the middlemen and tax collectors of the Near East, and he gloomily predicted, “There is no doubt that the Hungarians, Germans, Flemish, and French, and those beyond the mountains, who formerly came to Venice to buy spices with their money, will all turn towards Lisbon, for it is nearer to all the countries [of western Europe] and easier to reach.”

Venice contemplated ruin; King Manoel contemplated wealth and grandeur. Of course, as spices continued to flood into Lisbon from India, the present scarcity-inflated prices would have to tumble; but when the economic dislocations were ended, Portugal was sure to displace Venice as the spice capital of Europe. Manoel himself would be the chief beneficiary of this prosperity, for most of the vessels that had gone to India thus far had been royal ships, the profit of whose cargoes would go to the king’s private account. Manoel had proclaimed the spice trade a crown monopoly in 1500, although he was willing to let outsiders send licensed trading vessels to the Orient for a fee of one-fourth of the value of their cargo.

Simply bringing the spices to Lisbon was only part of the process of growing wealthy, though; Manoel had to be able to sell them, and that meant setting up distribution channels in Europe. There were many willing bankers eager to help him, most notably the German house of Fugger. The Fuggers, an Augsburg clan that had come to prominence late in the fourteenth century, had won their first wealth by
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selling German textiles to the Venetians. Fuggers imported wool, cotton, and dyes through Venice, shipped manufactured goods the other way, and gradually built powerful connections in the Italian city, Europe’s center of commerce and finance. In time, the Fuggers were the chief outlet through which the pepper that entered Venice flowed on to the rest of Europe.

The attention of the Fuggers was diverted from Venice to Lisbon in 1485. The year before, Diogo Cão had returned from his first voyage to Africa, bringing a cargo of the spice known as malagueta pepper. More pungent than the pepper of the Indies, malagueta had never been available in commercial quantities in Europe before; now the Portuguese could bring it in far more cheaply than the regular Asian pepper. Jakob Fugger, twenty-six years old but already skilled in the family ways, persuaded King João II to let the Fuggers handle distribution of the African pepper. The Fuggers handled it so well that they were able to keep the price on a par with that of Asian pepper, producing immense profits for all concerned. When Jakob Fugger returned to Augsburg, he left as his lieutenant in Lisbon a Spanish banker, Cristóbal de Haro, who was to become a key figure in the coming age of discovery.

The replacement of João II by Manoel in 1495 created problems for the Fuggers. They anticipated the attainment of India by sea and knew that it promised far greater profits than the relatively small trade in African pepper; but at first Manoel kept them at a distance, preferring to do business with Florentine bankers instead. Cristóbal de Haro tried to invest both in Gama’s voyage and in Cabral’s, but both times he was shut out in favor of the Florentines. However, Manoel needed loans to finance further voyages to India, and Haro made the boundless Fugger wealth available. As a result, the Fuggers were allowed to take part in
the third Portuguese expedition to India, which left in the spring of 1501, even before Cabral’s return. There were four ships under the command of João da Nova. En route, Nova heard of Cabral’s troubles at Calicut, and so he went straight to Cochin to purchase spices; his next stop was Cannanore, where he took on more cargo and captured a ship of Calicut, taking possession of the pilot, three silver navigational instruments, and 1,500 pearls. He returned to Portugal in September 1502, laden with pepper. Thereafter, the Fuggers and Cristóbal de Haro were deeply involved in Portugal’s spice trade. Through Fugger channels the spices went from Lisbon to Antwerp—where the Fuggers maintained warehouses—and thence through the British, Scandinavian, German, Flemish, and Bohemian markets, while the Florentines were distributors to Spain, Italy, and France.

As the European commercial picture thus changed, King Manoel took steps to assure the permanence of Portugal’s new fortune. A logical beginning was retribution for the massacre of Cabral’s men at Calicut. Late in 1501 a large fleet was assembled under Cabral’s direction; but at the last minute Manoel performed a typical maneuver, abruptly sending Cabral into retirement and calling forth Vasco da Gama to command the armada. There were 25 ships, 12 belonging to Manoel, 13 to private merchants. With calculated savagery, Gama inflicted terrible revenge on the inhabitants of Calicut, intercepted and raided Arab ships wherever he found them, and otherwise achieved his purpose of intimidating the entire Moslem commercial community along the Indian Ocean. As a result, he was able to set up Portuguese factories, or warehouses, at Cochin and Cannanore, and arrived at treaties with the local rulers fixing weights, measures, and prices. When he set sail for Portugal in December 1502, he left a number of his ships
behind to protect the factories and patrol Indian waters. Thus Portugal attained her first solid grasp on the Malabar Coast and guaranteed herself a steady supply of spices.

The arrival of seven of Gama's heavily laden ships at Lisbon in September 1503 sent new paroxysms through the Venetian spice market. The Venetians had ended their war with the Turks in 1503 and again were able to reach the ports of the Levant, but spices had become impossibly dear there and the Venetians could not compete with Lisbon. At Cairo, pepper was soaring toward its 1505 high of 192 ducats the hundredweight; meanwhile, at Lisbon, the price was falling to 40 ducats, to 30, in 1504 to 20, and still allowing a good profit. Envoys from Venice had told the Sultan of Egypt in 1502 that he must use his influence in the Moslem world to drive the Portuguese from the Indian Ocean. Unless he could guarantee to Venice a steady supply of spices at reasonable cost, they said, they would halt trade with Cairo altogether and get their pepper wholesale at Lisbon. The Egyptian ruler, though, had no way of blocking the Portuguese; the best he could do was tell the pope that he would attack the Christian shrines in the Holy Land unless the penetration of India by Portugal was ended at once. It was an idle threat; the Portuguese continued to sail to India, and by 1515 Venice was buying her spices in Lisbon, not in Alexandria, Beirut, or Cairo.

The Portuguese hand grew stronger. Gama's mission of conquest of 1502-03 was followed by another fleet in 1503, commanded by one of Portugal's grandest military heroes, Affonso de Albuquerque. This armada arrived at Cochin just in time to save that friendly Indian port from an invasion by Calicut. The grateful ruler of Cochin allowed the Portuguese to station a permanent garrison in his city. Soon after Albuquerque's return to Portugal, the Zamorin of Calicut attacked Cochin again; after a series of bitter battles,
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the zamorin was slain and the fleet of Calicut was dispersed by the Portuguese forces.

Once more a rich cargo of spices was unloaded at Lisbon. The successive and successful India voyages had so flooded the Portuguese market by the beginning of 1505 that there was real danger of undermining the spice trade completely. Accordingly, King Manoel began to rig the market. Working through the Casa da India—the arm of the Portuguese bureaucracy that regulated overseas trade—the king established fixed rates for the sale of spices by private merchant-venturers importing commodities from India for their own accounts. All spices brought in by the ships of these private merchants, such as Cristóbal de Haro or the Florentines, were deposited at once in the royal warehouses. The king collected his share first—25 to 30 percent of the cargo, depending on individual contracts—and the remainder was sold by officials of the Casa da India at the fixed prices on the merchants' behalf. Since the purchase prices in India were also fixed by contract, the only risk for the merchants or the king, in theory, lay in the loss of ships at sea. According to the 1505 regulations, pepper was bought in Cochin for three ducats the hundredweight and sold at Lisbon for 22; cinnamon, three and a half ducats the hundredweight to buy, 25 to sell; cloves, seven and a half to buy, 60 to sell; nutmeg, four ducats to buy, 300 to sell. It was a beautiful scheme, marred only by King Manoel's lack of control over the laws of supply and demand. As the caravels continued to return from India, Lisbon's warehouses began to overflow. By May 1506 some 40,000 hundredweight of spices lay in storage awaiting buyers. The merchants, eager to realize their profits, pressed the king to let them liquidate this backlog, even if it meant selling at lower prices. Manoel held firm for a while, but weakened when the merchants began to refuse him loans to finance
his many expansionist ideas. By 1507 he was compelled to allow a freer trade in pepper and other spices. Luckily for Portugal, the dynamic growth of the distribution channels operating out of Antwerp prevented a collapse of the spice market after all, at least for several decades.

Manoel's other concern in 1505 was the possibility that the Sultan of Egypt would heed Venice's pleas and interfere with Portugal's access to India. The sultan's blackmail attempt involving the shrines of Palestine had come to nothing because, as Manoel had guessed, the sultan depended too heavily on the tourist revenue of Holy Land pilgrimages to make good his threat; but when word reached Manoel that the sultan had decided to build a fleet to attack Portuguese shipping, Manoel took action. The lesson of Albuquerque's voyage of 1503 was clear: only by building a chain of forts in the Orient could Portugal be certain of maintaining her trade route. The king conceived an ambitious program of military conquest and occupation in the spice lands. In 1505 he appointed Francisco de Almeida as his first Viceroy of India and assembled a fleet of twenty-two vessels. Almeida's assignment was to meet the Moslem threat by conquering and fortifying every important port on the Indian Ocean.

The armada sailed on March 25, 1505. Among the 1,500 sailors, soldiers, and laborers it carried was a young man making his first major voyage: Fernão de Magalhães, whom we call Ferdinand Magellan.