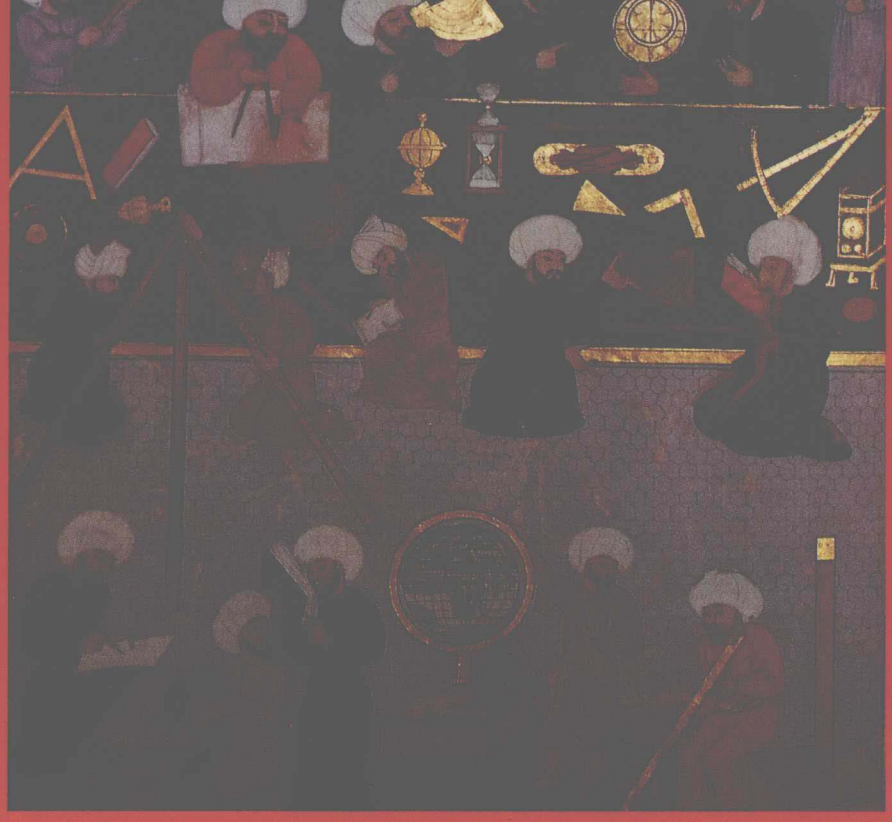
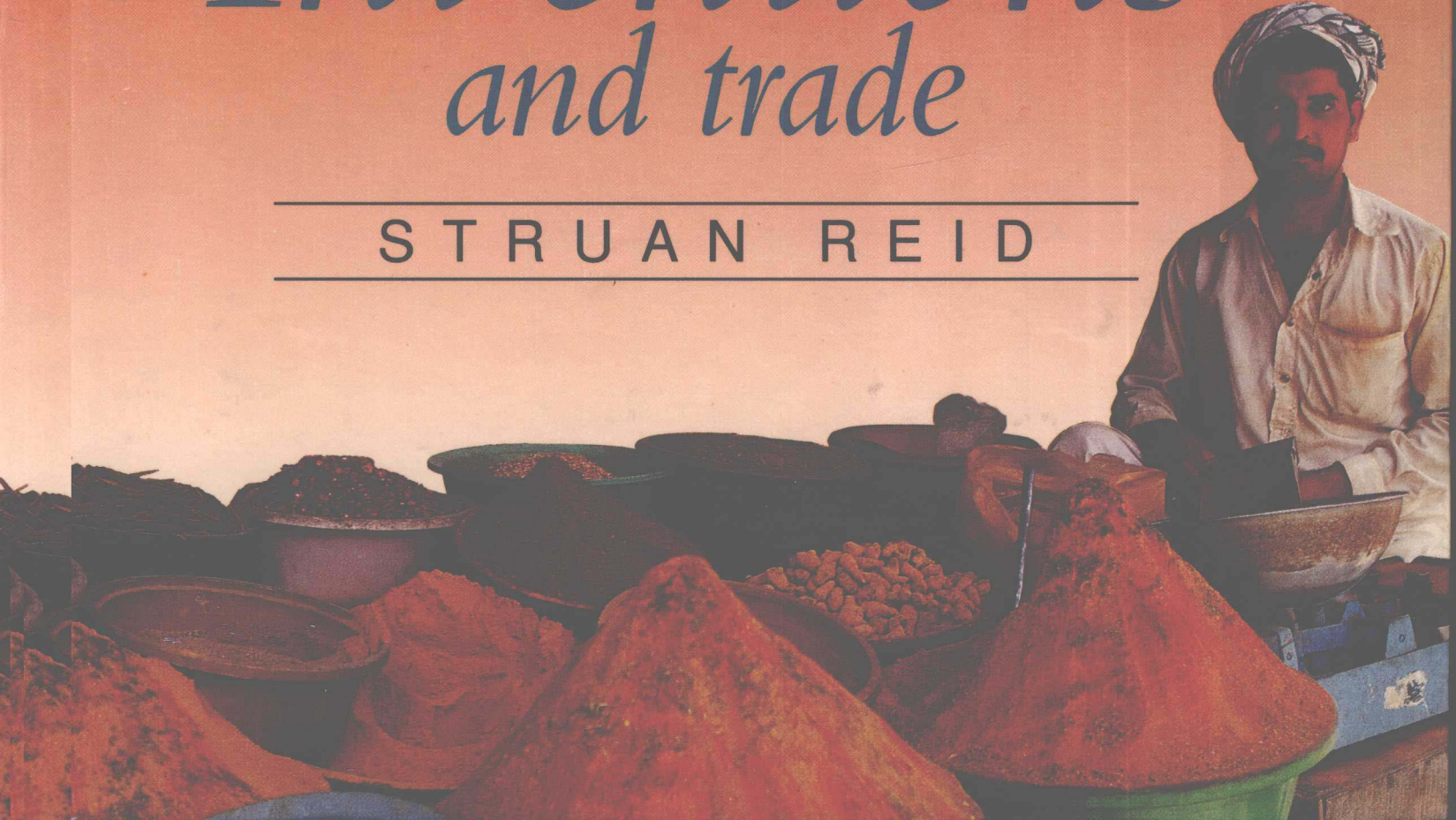


UNESCO
INTEGRAL STUDY
OF THE SILK ROADS

THE
SILK AND SPICE
ROUTES

Inventions and trade

STRUAN REID



THE

SILK AND SPICE ROUTES

Inventions and trade

STRUAN REID

UNESCO

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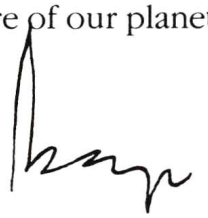
Foreword

The story is told how Xiling Shi, while strolling one day in the garden, casually plucked a white cocoon from the leaf of a mulberry tree under which she was passing. She later chanced to drop the cocoon in a bowl of steaming tea and, in attempting to retrieve it, found herself unraveling a long white thread. Xiling Shi was the wife of Huangdi, the semimythical emperor who ruled China nearly 5,000 years ago; and it was in this way, according to legend, that she discovered the secret of what was to become one of China's most valuable and distinctive products—silk.

Silk was in fact only one of many precious goods exchanged between East and West along what later came to be known as the Silk Roads. Jade and lapis lazuli were carried along these routes, as were spices, fruits, and flowers such as ginger, pomegranates, and roses. Some of our basic technologies like printing and papermaking were also transmitted along these ancient arteries. Ambassadors, scholars, craftsmen, entertainers, monks, pilgrims, and soldiers all journeyed along the Silk Roads, acquiring and spreading knowledge as they went.

UNESCO is the United Nations agency responsible for promoting cooperation and understanding among nations in the areas of education, science, culture, and communication. One of its current projects is the "Integral Study of the Silk Roads: Roads of Dialogue," which seeks to explore and highlight the rich cultural exchanges and contacts that took place along the ancient Silk Roads. As part of this project, UNESCO has organized a series of expeditions over land and sea, retracing with international teams of scholars, filmmakers, photographers, and writers the journeys of those who traveled these routes through the ages.

I am sure you will enjoy reading this book in *The Silk and Spice Routes* series, copublished by UNESCO and New Discovery Books. I hope that your new knowledge about these fascinating channels of trade and communication will enable you to better understand some aspects of cultures different from your own. You will in this way—unwittingly as Xiling Shi when she discovered silk—be adding your own personal thread to that precious web of understanding between members of the human family on which the future of our planet depends.



Federico Mayor
The Director-General
UNESCO

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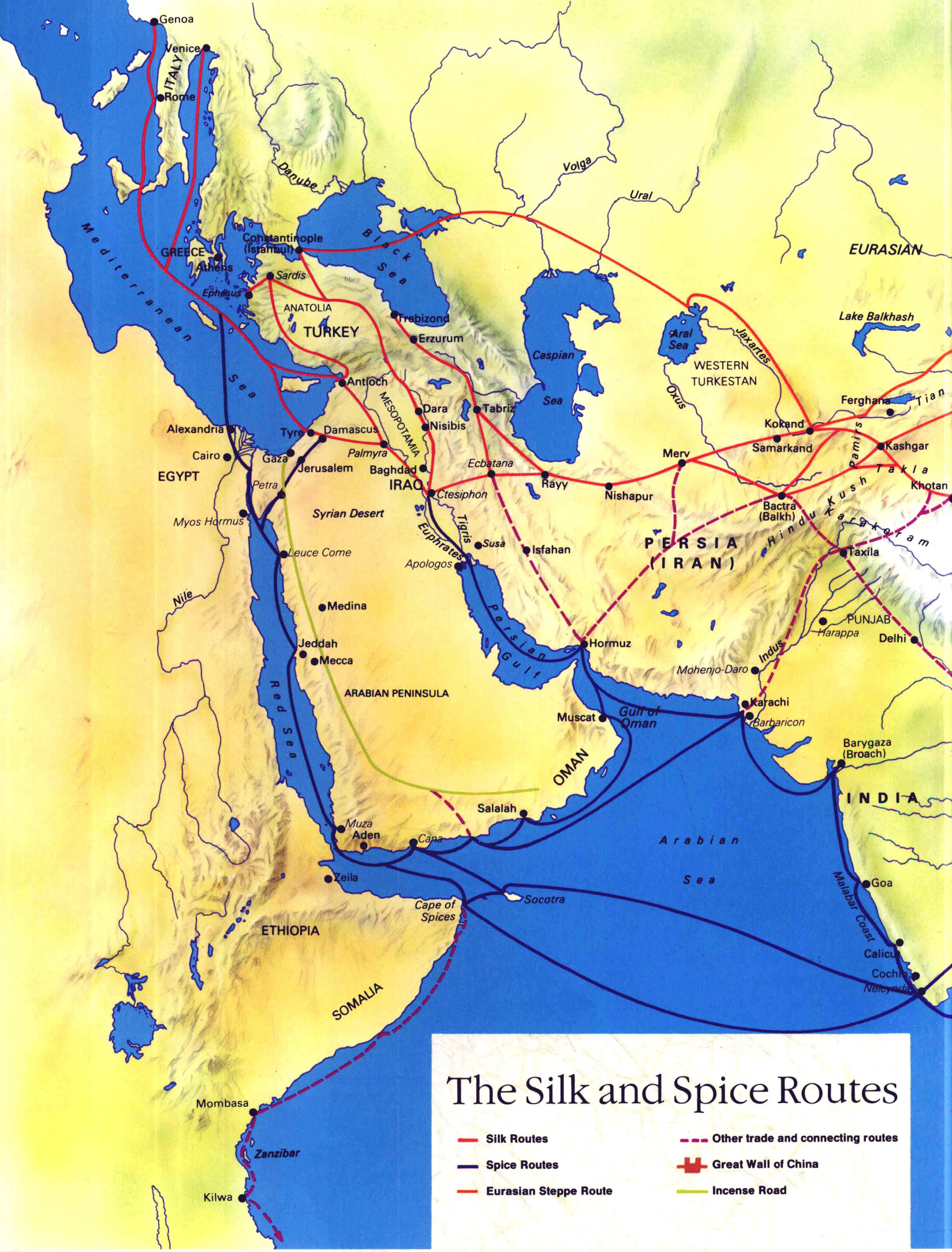



Lake Baikal
STEPPE
Karakorum
MONGOLIA
Gobi Desert
Urumqi
Turfan
Shan
Kuqa
TARIM BASIN
Dunhuang
GANSU CORRIDOR
makan
Shang-du
Great Wall
Khanbalik (Beijing)
Shangtung Peninsula
KOREAN PENINSULA
JAPAN
Nagasaki
Yellow Sea
Huang He (Yellow R.)
Huai
Loyang
Changan (Xi'an)
Hangchou Bay
Chang Jiang (Yangtze)
Foochow (Fuzhou)
PLATEAU OF TIBET
CHINA
Zaitun (Quanzhou)
Formosa (Taiwan)
PACIFIC OCEAN
Canton (Guangzhou)
Himalaya
Brahmaputra
Ganges
Cattigara
Haiphong
PHILIPPINES
Tamralipti
Pegu
Srijaijaya
South China Sea
Bay of Bengal
Chola Coast
Oc-eo
Isthmus of Kra
MOLUCCAS (The Spice Islands)
Madras
Pondicherry
BRUNEI
CELEBES
Anuradhapura
INDIAN OCEAN
SRI LANKA
MALAYSIA
Malacca
Str. of Malacca
Singapore
BORNEO
SUMATRA
Srivijaya (Palembang)
Jakarta
JAVA
to Madagascar
to Ma...

chapter one

The Paths of Innovation

An Exchange of Riches

▼ *Ships old and new still travel the Spice Routes. A modern Omani containership enters the port of Muttrah, where a traditional Arab dhow is already anchored. Many technological advances in ship-building and navigation were made through trading links.*

Over many centuries, the Silk and Spice Routes, two of the greatest trade routes in our history, wound their way across Asia, linking its people and those of Europe in a network of paths and highways, cities, towns, and ports. Kingdoms and empires rose and grew fat from the proceeds of the rich trade that passed back and forth along the routes. Some of these civilizations lasted for many hundreds of years, while others held only momentary glory, soon extinguished by a more powerful people eager to wrest the trade from their control.

The Silk Route crossed Asia by land, its paths stretching over some 5,000 miles. Starting from the ancient Chinese capital of Changan (modern Xi'an), it made its way northwest along the length of the Great Wall of China, dividing into two to skirt the Takla Makan Desert and using several high passes to cross the snow-covered peaks of the Pamir Mountains, one of the mountain ranges in central Asia that form the "Roof of the World." Travelers then moved through the lands of Afghanistan and Iran and on to the Mediterranean Sea. The valuable goods were then transferred to ships bound for Europe.

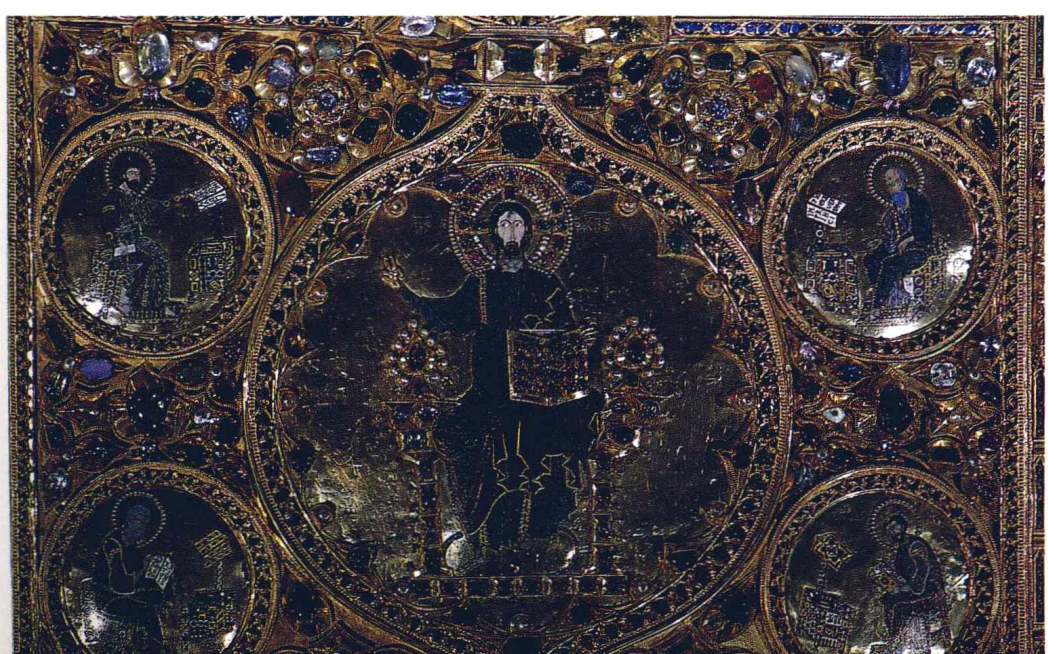
► *A view of the Moluccas island of Tidore seen from Ternate. The Moluccas or Spice Islands were the only source of cloves and nutmeg until the 18th century.*

The sea-lanes that made up the Spice Routes spread out around Asia over a distance of 9,000 miles. Their focal point was the famed Spice Islands, the string of Indonesian islands known today as the Moluccas, the only place where the sought-after pungent cloves and nutmegs grew. From here the Spice Routes fanned out over the China seas to China and Japan and westward to India and beyond. To reach Europe and the Mediterranean, the merchandise was carried up the Persian Gulf or the Red Sea and overland via cities such as Petra, Palmyra, and Alexandria.

The convoys of ships and the camel caravans were piled high with the luxuries of the East that were so much in demand in the cities farther west: not only spices and silks, but perfumed woods, rare animals and plants, and ivory. These were exchanged for Western goods such as lengths of cotton and woolen cloth, coral, amber, gold, and silver.

However, rare and exotic goods were not the only items to be carried up and down the Silk and Spice Routes. The routes also acted as paths for the exchange of knowledge: ideas on new technology and scientific skills, languages, art, and religion. Some of the most fundamental technologies—among them writing, weaving, agriculture, and riding skills—evolved and developed in this way. This book looks at the part that the trade of the Silk and Spice Routes played in spreading information on science, technology, and inventions all over the world.

▲ *Rare and prized objects were traded across great distances from the earliest times. This necklace found in Wiltshire, England, dates from 1750–1500 B.C. It is made from amber brought from the Baltic. Amber was also traded eastward from there deep into Asia.*



◀ *Part of the Pala d'Oro in the Basilica of St. Mark's, Venice, begun in 1005. From the 12th–16th centuries, the city-states of Venice and Genoa became extremely rich because they had a virtual monopoly in the trade coming into Europe from the Silk and Spice Routes.*

▲ *The Ptolemy cameo dates to 278 B.C. It shows the head of Alexander the Great and his Bactrian queen, Roxana. From 336–323 B.C., Alexander conquered most of western Asia, leading to a great exchange of ideas between Greek, Persian, and Indian cultures.*

▲ *14th-century porcelain vase produced in China during the Mongol Yuan dynasty (1264–1368). The Mongols controlled most of the rest of Asia at this time and trade flourished. Significantly, this vase is the first piece of porcelain on record to reach Europe.*

Technology, Civilization, and Empire

Technology is the tool of civilization and, in turn, technological advances contributed to the growth of civilization and the empires that went with it. The discovery and increasing use of iron demonstrates this process. Iron smelting first developed in Asia Minor about 1500 B.C. and the knowledge spread from there from about 1200 B.C. When agricultural implements such as hoes and plows, as well as weapons, could be made of iron, the effect on the society and economy of the region was enormous. With the increase in agricultural productivity came a surplus of food that led to economic development and state-building. Trade increased, resulting in a greater demand for the craftsmen needed to produce the goods for the trade. The new iron tools also made it possible to build bigger and better ships, which in their turn enabled longer sea journeys to be made and increased trade and colonization.

With this growth in trade and technology there came a need for political reorganization. Local tribal chiefs and their clans were replaced by kingdoms and then empires. These new empires enforced law and order, which then took the process further, making possible long-distance trade by land and sea. With the thousands of merchants, soldiers, and sailors who crisscrossed their way through Asia and Europe came a constant exchange of scientific and technological ideas, innovations, and inventions.

It was the existence of three strong empires in about 100 B.C. that finally enabled a land route, the Silk Route, to operate effectively across Asia: the Roman Empire in the West, the Chinese Empire of the Han dynasty (202 B.C.–A.D. 220) in the East, with the Parthian Empire in Persia (Iran, c. 247 B.C.–A.D. 224) between the two. All three were looking to expand their interests both politically and commercially and, having done so, had the power to administer and maintain them. The Romans, too, encouraged the Spice Route trade from the Red Sea to India in an attempt to bypass the Parthians. The Romans and Parthians were longtime rivals for power in western Asia, so both were reluctant to give each other the profits that resulted from trade.

Conflict and competition such as this between empires and kingdoms, cities and towns set the pattern of trade and communications along the Silk and Spice Routes throughout their history. In times of war or political uncertainty, fewer people would risk the dangers of travel over any great distance. The collapse of the Han dynasty in A.D. 220 led for a while to a virtual halt in trade between China and the West. In general, the stronger the empire, the better the communications and the greater the exchange of information. However, these elements are interlinked. The success of one contributes to and feeds off the growth of the others. At times, it is almost impossible to separate them out into cause and effect.

▲ *A stone column, engraved with one of the first written codes of laws, the Code of Hammurabi, king of Babylonia (c. 1792–1750 B.C.)*

► *Ruins of Persepolis in Iran, capital of the ancient Persian Empire of the Achaemenid dynasty. The Achaemenids ruled from 550–330 B.C., excelling in the technology of engineering and warfare, which helped them to maintain their large empire.*

chapter two

The Necessities of Trade

Overland Travel

▲ *3rd-century A.D. Persian silver gilt dish. It shows a scene of a man hunting on horseback. The horse's tack, including its reins and stirrup, is carefully depicted.*

The establishment of overland trade routes was, of course, dependent on people's ability to travel long distances and to carry a reasonable quantity of trade goods with them. The different types of countryside —hills, mountains, rivers, and vegetation—all influenced the types of routes chosen, but it was animals, such as horses and camels, that really opened up the opportunities for people to travel longer distances and over longer periods. Until the railroads of the 20th century, this was the means that enabled large-scale overland trade to take place.

The type of transport varied along the Silk Route, with merchants using either ox- or horse-drawn carts, camels, pack asses, or pack horses, depending on the land being crossed—different animals were better suited to different terrains. The merchant might ride on a horse or a donkey, but he often walked beside the animals carrying the goods. The merchandise rarely traveled from one end of its journey to the other with the same traders, and never with the same pack animals. Usually goods changed hands a number of times along the way.

The domestication of the Bactrian camel took place in the second millennium B.C. at the hands of the nomads of central Asia. The Arabian camel was domesticated at about the same time. Both types, the

▼ *Mongol nomads rounding up their horses. This is a modern continuation of their ancient traditions of breeding and riding horses.*

Bactrian camel with two humps and the Arabian with one, have an amazing capability, vital for desert travel, of going for days without water. They need little food and carry much heavier loads than horses over distances of 20 miles a day.

The horse has long been an important means of transport and was the animal most frequently used from one end of the Silk Route to the other. Throughout the third millennium B.C., the nomads of central Asia had been breeding larger and stronger horses. The larger horses made riding possible. This skill was extremely useful, particularly in battle, and was gradually acquired across Asia.

▼ *For heavy loads, stronger animals, such as these bullocks pulling carts in Mongolia, were used along sections of the Silk Route.*

◀ *Camels were not just used as pack animals. This stone relief shows an Arab in battle mounted on a camel. He is being pursued by the Assyrian cavalry on horseback.*

Improvements in the techniques of controlling the animals followed, especially the introduction of the foot stirrup and a harness with breast and collar straps. These revolutionized the transportation of people and goods. Both appeared first in China, although the stirrup may have had its origins in central Asia, where leather or rope straps were often used to assist in mounting horses. The use of stirrups gradually spread westward across central Asia and Afghanistan, and was introduced to Europe in the sixth century A.D. by the Avars of the Eurasian Steppe. The stirrup gave the Avar cavalry the upper hand in its battles with the forces of the Byzantine Empire. The Byzantine cavalry had to be completely reorganized as a result and later adopted the stirrup itself.

Sea Transport

► *13th-century manuscript illustration from the* Maqamat *of al-Hariri. It is one of the few surviving depictions of Arab shipping before the arrival of the Portuguese. Notice how the planks of the vessel are clearly stitched together, not nailed.*

Across mountain and desert, the camel and horse could hardly be bettered as a means of transport. By contrast, there was always room for improvement in the ships that traveled the Spice Routes. Developments in ship design and construction methods came about in response to challenges encountered in trading ever farther afield. Observations made and information exchanged on these journeys also brought practical knowledge. So the expansion of trade by sea was closely bound up with the evolution of shipping and navigation.

Some of the Spice Routes had been in operation from as early as

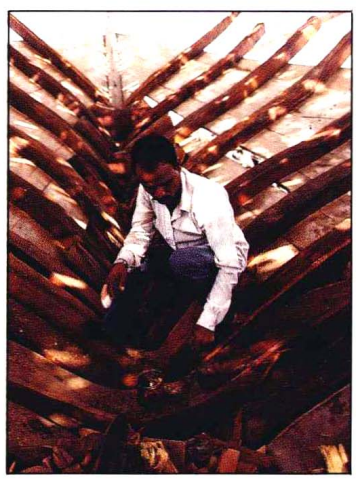
2000 B.C. and the Romans had established them as an effective rival to the Silk Route for the passage of East-West trade. But it was under the Arabs and Omanis from the seventh century onward that the sea routes really came into their own. The Arabs quickly recognized the importance of sea power in defending their new and rapidly expanding Islamic empire. But they also came to see the great advantages that sea transport gave them in trading their products and earning them wealth as the predominant sea carriers between East and West.

With their conquest of Syria (part of the Byzantine Empire) in the seventh century, the Arabs employed Syrian and Greek shipwrights to build them a powerful Mediterranean war fleet. Farther east, a second war fleet was built for the Arabs by Persian shipwrights. All the ships and boats were carvel-built, that is, the planks of the hulls were laid edge to edge, not overlapping as they were in clinker-built ships common in northern Europe. But the ships of the Western Fleet followed the Greek and Syrian technical traditions, with the planks nailed to an internal framework. The ships of the Eastern Fleet, however, were built according to Persian and Indian practice, with the hull planking "sewn" together with palm-fiber twine, which was cheaper and more easily available than iron nails.

◀ *The* Zinat al Bihaar, *a recently built Omani* baghla *belonging to the sultan of Oman. The decorated stern of the ship is following a tradition introduced into the Indian Ocean by the Portuguese.*

It was in the Indian Ocean that the triangular lateen sail first appeared, and the Arabs introduced it from there to the Mediterranean sometime during the seventh or eighth centuries. The lateen sail, although not easy to handle, enables a ship to sail much closer to the wind and so take more direct and quicker routes. The Portuguese caravel, in which they made the first European journeys around Africa to India, was similar in design to the Arab *baghla,* with lateen sails and carvel (caravel) planking for the hull.

Until the arrival of the Portuguese in the Indian Ocean at the end of the 15th century, little change took place in the design of ships in the area. However, the competition from the Portuguese boats led the Arabs and Omanis to substitute the stronger nailing for sewing in the construction of their ships. A square-sterned European design was also introduced in place of the sharp two-ended stern previously characteristic of Persian Gulf and Indian Ocean shipping.



▲ *An Arab boatbuilder works on the construction of a dhow, a smaller sailing boat still used throughout the Indian Ocean.*

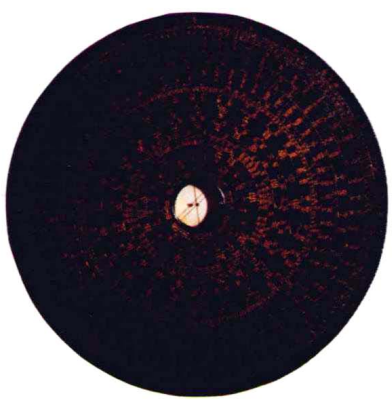
▲ *This illustration from the 15th-century* Livre des Merveilles *is the first to show a compass in use in European shipping.*

Finding the Way

Even the most experienced sailors frequently found themselves off course. Storms, shipwrecks, and strange and often hostile lands were hazards common to all seafarers. Finding the way became easier as the larger and better-designed ships sailed farther. Sailors brought back practical knowledge, as well as trade goods, which led to more detailed mapping of the oceans and coasts and improvements in the design of navigational instruments.

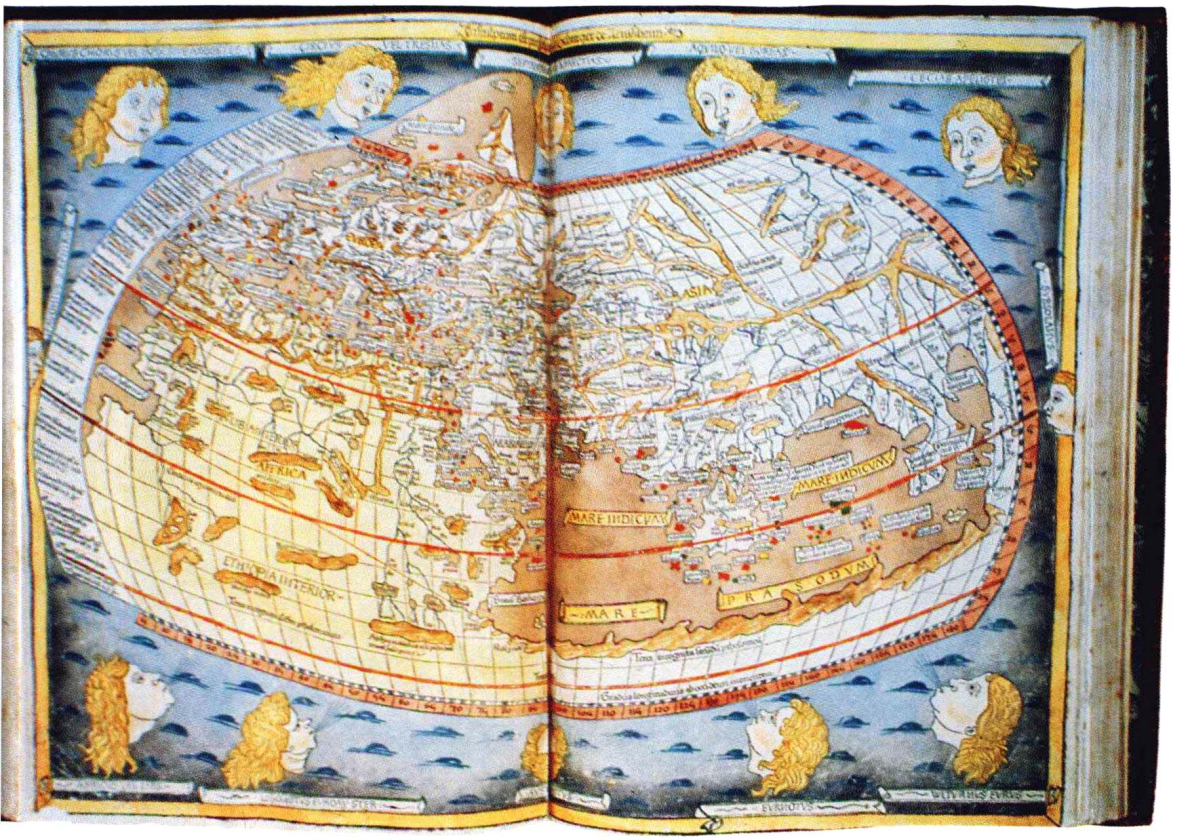
Once again, the Muslim sailors of Persia, Arabia, and Oman added a great deal of knowledge to world geography, which they passed on to the Europeans. In particular, there was a lot of exchange of Islamic expertise in drawing up nautical charts, known as portolans. These were very important tools for the mariner as they gave wind directions and bearings needed to sail from port to port.

In the mid-12th century, detailed information on India, China, and North Africa was passed to the Europeans through the patronage of two kings of Sicily—Roger II (1127–1154) and his son William I (1154–1166). With their backing, an Arab scholar from Morocco named al-Idrisi (1100–1166) produced a complete description of the world as then known to the Muslims. This information was set out in a series of 70 maps with a written description in a volume known as the *Kitab al-rujari* (The Book of Roger).



▲ *A Chinese geomancer's compass used to make sure a building faced in a direction favorable to good luck. The navigational compass developed from this earlier use.*

► *Page from a portolan atlas c. 1650 showing the Arabian Peninsula and the eastern Mediterranean.*



◀ *A map of the world dating to 1486, based on Ptolemy's* Geography.

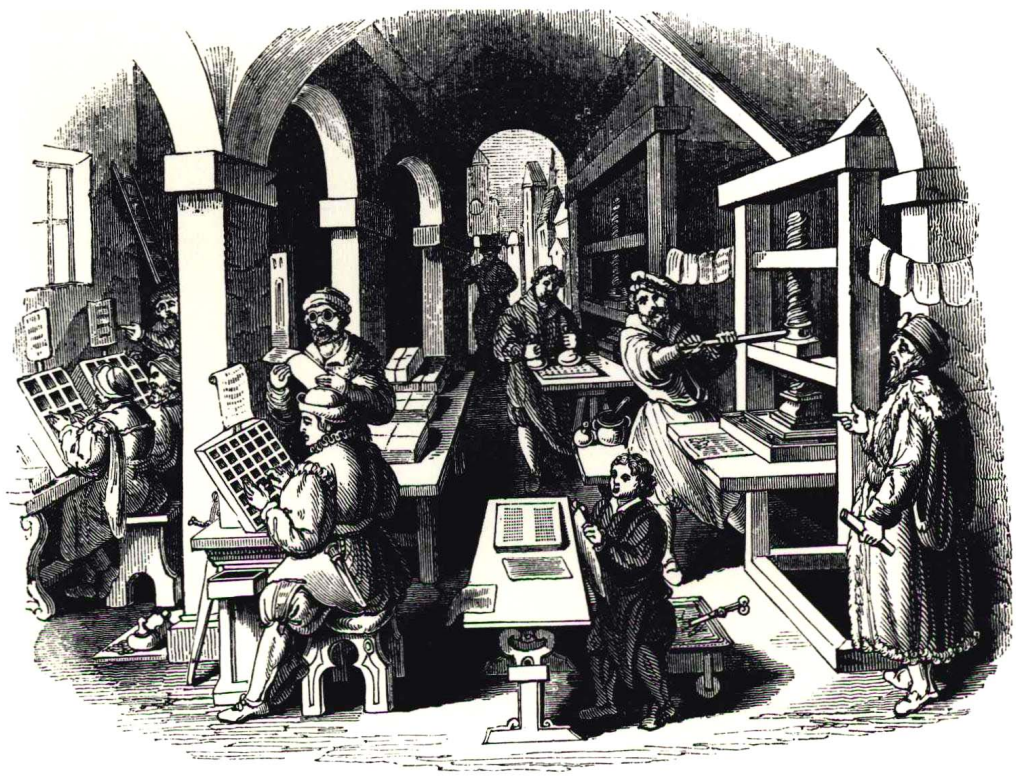
Al-Idrisi's knowledge and that of earlier Arab geographers was partly based upon Persian-Sasanian, Indian, and Greek sources. The influence of Sasanian geographical knowledge can be seen in many areas, such as the name for the Indian Ocean, which the Arabs called *bahr al-fars* (the Persian Sea) following Sasanian examples. Indian and Greek geographical works were translated into Arabic, including those of the Graeco-Egyptian geographer, astronomer, and mathematician Claudius Ptolemy (c. A.D. 90–170). His monumental work, the *Geography,* was an early attempt to map the known world and provided the basis for much later Arabic cartography.

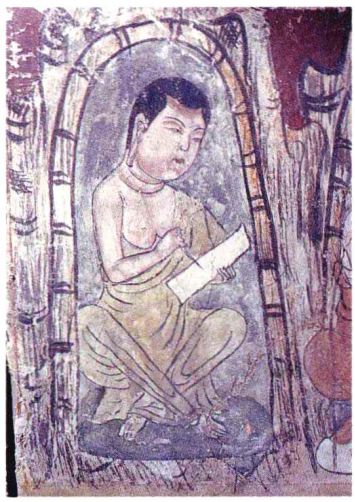
In the area of navigational instruments, the introduction of the mariner's compass to western Asia and Europe at the beginning of the 13th century marked a significant stage, for the first time permitting accurate directions for navigation. The magnetic compass had existed in China for a number of centuries before, but it was only late in its history that it came to be used for navigation at sea, sometime between 850 and 1050. The Chinese were active in the Spice Route trade, although their junks were often sailed by Koreans, and the compass seems to have reached Islam and Europe at about the same time through nautical contact with China. The first mention of a compass in European writings occurred in 1190 and in Arabic writings about 1232.

▲ *One of the maps from the* Kitab al-rujari *(The Book of Roger).*

Recording Information

► *Engraving depicting a Dutch printing office in the late 16th century. It shows the various stages involved in printing a book, including the arrangement of the movable type.*





▲ *8th-century wall painting from a cave temple on the Silk Route to the west of Turfan. It shows a Buddhist scribe at work.*

Among the most important inventions in the history of civilization has been the art of writing, for it has enabled people to make permanent records of their achievements and culture. It is also an important tool of trade: commercial transactions can be recorded, along with taxes on goods and produce. Indeed, it seems it was largely for this purpose that writing systems were developed in the first place.

This development occurred in about 3000 B.C. among the Sumerians of Mesopotamia, now part of Iraq. It consisted of simplified pictures of objects, called pictographs. Independently, about a thousand years later, the Chinese also started to use a form of pictographs (characters) that is still the basis of the script they use today. However, in the West, a further innovation occurred around 1000 B.C., when the Phoenicians developed an alphabet. The Phoenicians, from what is now Lebanon, had an extensive trading empire around the Mediterranean. Probably as a result of their trading contacts, their alphabet became the foundation of many scripts still in use today. In Europe, the Greek and subsequently our Roman alphabet evolved from it. In Asia, it gave rise, through a script called Aramaic, to the Arabic, Hebrew, and Indian Brahmi writing systems.