CONTENTS

1

Premodern Regimes and Practices

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ON THE SIXTH OF NOVEMBER 1492, Christopher Columbus was exploring Cuba. In his journal, he recorded what the native inhabitants told him: information that filled him with excitement. They "said, by signs," that he could find plenty of cinnamon and pepper—samples of which he had brought and showed them—nearby. A couple of days before, old men had reported that locals wore gold "on their necks, ears, arms, and legs, as well as pearls." True, he also learned that "far away, there were men with one eye, and others with dogs' noses who were cannibals, and that when they captured an enemy, they beheaded him and drank his blood, and cut off his private parts." Even this unpromising report did not dismay Columbus. On the contrary, it confirmed what he had believed and hoped since he reached land in October: that he had arrived, by traveling west across the Atlantic, at the Indies, near China, "the land of the great Cham."

Columbus knew where he was: at or near the eastern sources of the two great sets of trade routes that brought luxuries from the East to Latin Christendom and trade goods and money from Latin Christendom to the East: the Silk Road and the Spice Route. Both had functioned, more or less regularly, since the early centuries of the Common Era. Both had generated wealth for those who created silk and harvested spices to sell and for the numerous intermediaries who brought them to market. And both had been the sources of information of many kinds, about everything from distant lands to the properties of foods and spices. But both routes had been disrupted, in the thirteenth century and after, by the rise of Mongol power in the steppes of central Asia. In Columbus's day, both were dominated by Muslim merchants and powers,

whom most Christians regarded as enemies—but from whom they bought, indirectly or directly, glossy consumer goods. When he heard tales of gold, pearls, and monsters in his vicinity, he knew he had arrived at the place where luxuries of many kinds originated. Immediately he inferred that he could enrich his masters, the Catholic Kings, both by eliminating middlemen and by domesticating the natives and putting them to productive work.

Columbus was wrong, of course, about the geographical facts. He was in the Caribbean, not the Pacific, the very existence of which was unknown to him and all other Europeans. And the local knowledge that he gleaned from the Cubans was inaccurate as well. Accounts of gold, pearls, and spices in Cuba proved to be greatly exaggerated. Investigation—as Columbus later informed the Catholic Kings—uncovered no men of monstrous form. This comes as no great surprise, since Columbus seems to have extracted these reports from the signs made by Cubans with whom he shared no language. Yet he had some reason to think as he did. An imaginary map of the world and its resources had formed over the centuries, as sailors and travelers told, and later wrote, tales. Monsters appeared on it, at the far end—from a European perspective—of the world, next to the lands from which silks and pepper were imported to Europe. These ancient images loomed before Columbus's eyes and shaped and colored what he saw.

After Columbus, travel—and the collection of information about the world—underwent a transformation. The Catholic Kings established permanent colonies and trade networks. They sponsored continuing, systematic collection of information, recorded and transmitted by pilots with formal training and credentials and military commanders with royal commissions. They and their rivals worked with sailors, merchants, and soldiers to begin the process that historians refer to as globalization: the uniting of the globe by institutions, sometimes paper thin but still constructed for the long term (Ghobrial, chap. 5).

Information travels: it moves, often unpredictably, with the people or the mediums that carry it. Information matters: states need reliable ways to collect, store, and access information and to provide it to their subjects, and merchants and bankers need it to serve their customers and outwit their rivals. Information abides: so long as its owners also possess a medium that can store it. This chapter sketches three histories of information. It follows the trading routes that brought luxuries from China and India across the world. It re-creates the information regimes that were created to govern the Roman Empire. And it examines the history of paper, a single medium for writing that had a powerful

impact. The result will not be a survey but a sketch map of some of the ways in which information was collected and stored, transmitted and accessed, before the full process of globalization began.

Silk Road and Spice Route

Exchange of goods and ideas is as old as human settlement. By 3000 BCE, caravans connected cities and markets across the Fertile Crescent and beyond. But the forms of trade that took shape early in the Common Era—and that eventually connected two great but distant empires, China and Rome—differed in scale, as well as distance covered, from anything that had preceded them. In the third century BCE, the Qin dynasty, based in the wealthy state of the same name, conquered the other six Warring States and created a unified government with a powerful military and civil service. It and its successor, the Han dynasty, ruled from 221 BCE to 220 CE. Always confronted by the obligation to feed their large population, China's rulers had to encourage agriculture. To do so it was necessary to protect their farmers from the Xiongnu, horse-riding nomad archers who lived on the steppes to their north and defeated them in 200 CE. Early military expeditions were unsuccessful. Gradually, the Chinese realized that the silk that they had learned to produce, in the Yangtze valley and elsewhere, was unique and desirable. The heavier and more complex brocades, produced by specialists for the imperial court, were reserved for the Chinese elite. But farming families also cultivated mulberry trees, grew silkworms, and produced thin, simple silks, with which they paid their taxes to the state. These silks, the Chinese found, could be traded to the nomads of the steppes in return for horses, which they needed for agriculture. The Han extended the walls that protected China from the nomads. But they also pierced them with gates, which in turn became the centers of trading stations. From these sprang the immense trade network conventionally called the Silk Road.

Across Eurasia, meanwhile, Rome developed great military power, which enabled it to defeat the trading power Carthage in the third and second centuries BCE. In the next century, Rome conquered Gaul and Britain, establishing farms and founding new cities, and took Egypt, which had been ruled since the time of Alexander by a Greek-speaking dynasty, the Ptolemies. Roman rule stretched from North Africa to Gaul and from Syria to Britain. New cities were founded, and older Greek cities prospered under imperial authority. As the elite of aristocrats and entrepreneurs who dominated Rome under the emperors became increasingly wealthy, new luxuries, arriving from China and

elsewhere in the East, found an eager market. Silk shocked Roman traditionalists, who complained that dresses made from it were immodest. But it became fashionable nonetheless. Roman merchants began to look for larger supplies. Fleets sailed from Alexandria to the eastern Mediterranean. Other traders traveled down the Nile and across land to the Red Sea coast, from which point they could sail to India in search of silk and other goods.

Contacts between Rome and China were not direct. Intermediaries ruled the thousands of miles of territory between them. Alexander the Great's expedition from Persia across Afghanistan and the Hindu Kush in the fourth century BCE did not extend his empire to the ends of the earth, as he may have hoped it would. But it transformed much of the world nonetheless. Alexander's conquest of Persia and looting of the immense royal treasury spread precious materials through the known world, making possible the creation of more coined money than had ever existed before. His hard-fought journey to India and back proved in the most dramatic way possible that large numbers of people and animals could move from the Mediterranean to Asia. The Greek-speaking cities that he founded across central Asia and the spread of the Greek language and Greek styles in art and religion, finally, brought lands and peoples that had previously existed in separation into contact with one another—contact that became more intense and regular as his successors invested in massive port facilities that supported trade.

Other intermediaries, equally vital, worked on a more local level. In the first century BCE the Yuezhi, another nation of steppe-dwelling nomads, founded the Kushan Empire in Bactria and India. They created cities modeled, in their layout and architecture, on those of the Greek world. Trade generated new forms of settlement, and these, in turn, perpetuated the trade. Caravan routes developed, which came to dominate central Asian trade. They also sponsored the growth of what became a new brand of Buddhist religion: one centered on monasteries, gifts to which were strongly encouraged, and which soon collected massive endowments. Further west, the Nabateans—an Arab people who lived in northern Arabia and the Levant—engineered water systems that enabled them to settle in the desert. They built caravan cities, whose traders moved silk into Parthian and Roman territory, and ports. Though the Nabateans were conquered by the Romans, the wealth that trade generated for them enabled the creation of Petra, a city cut from the rocks of a gorge in Jordan. Sculpted façades deftly combined Greek and Roman architectural forms with local ones. By the third century the Sogdians—an Iranian people whose lands were centered on Samarkand, in modern Uzbekistan—were also actively

engaged in commerce along the Silk Road. They set up trading zones everywhere from the Byzantine Empire to China itself, where they settled in large numbers. These and other nations created the aggregate of trading routes that made up the Silk Road.

Meanwhile a second set of trade routes developed—one that intersected with the first but involved maritime as well as overland trade. For centuries, the inhabitants of southern Arabia—Arabia Felix—had tapped trees that flourished in their desert habitat for aromatic resins like frankincense and myrrh—the gifts that the Magi, wise men from the East, bring to the baby Jesus in the Gospel of Matthew. Employed in the creation of incense, perfumes, and medicaments, the oil from these resins came to be valued from China to Greece. Traders who used camels as their beasts of burden (since they could cross the desert on their thickly padded feet and required far less water than horses) formed caravans to carry it to Parthia and Rome. The Nabateans and other intermediaries offered vital help and shelter. As Roman sailors based in Egypt mastered the prevailing winds of the Indian Ocean, they moved back and forth between East Africa and western India, where they could exchange these precious resins and other products for the even more precious spices made in India and beyond: pepper above all.

The silk and spice trades linked China, Rome, and many lands between in a complicated but effective system of exchanges, one that brought gold and silver, slaves, and other products from the lands to the west and exchanged them for pepper and incense as well as fine silks. These systems were supported more by self-interest and curiosity than government policy, more by traders cooperating than by formal institutions. Yet they proved flexible and resilient. As the western Roman Empire weakened after the fourth century, the new city founded by Constantine at the meeting point of Asia and Europe, New Rome (later Constantinople), turned into one of the great entrepôts for trade in luxury goods between the edges of the world. Even the Mongol invasions of the thirteenth century and after did not cut these trade routes, though they changed them in important ways. While the techniques used by traders and the sailors who transported their goods changed over time, these long-distance trade routes proved strikingly durable.

Information and its transmission were woven into these trade routes from the start. The Han emperor Wudi (147–87 BCE) called for an official to undertake an embassy to the Yuezhi, in the hope of allying with them against the Xiongnu. Only Zhang Qian, a minor official, proved willing. His embassy turned into an epic. It lasted for thirteen years, most of which he spent in

captivity. He failed to make the treaty Wudi had sought. But he succeeded in something of much greater import in the long run. His reports, preserved in later Chinese histories, show that he was a sharp observer with an eye and ear for detail, who used his time in foreign lands to learn a great deal. He drew up crisp ethnographies, replete with information about resources, crops, and potential trading conditions.

> *An-si* [Parthia] may be several thousand *li* west of the Ta-yue-chi. The people live in fixed abodes and are given to agriculture; their fields yield rice and wheat; and they make wine of grapes. Their cities and towns are like those of Ta-yuan. Several hundred small and large cities belong to it. The territory is several thousand *li* square; it is a very large country and is close to the K'ui-shui [Oxus]. Their market folk and merchants travel in carts and boats to the neighboring countries, perhaps several thousand *li* distant. They make coins of silver; the coins resemble their king's face. Upon the death of a king the coins are changed for others on which the new king's face is represented. They paint [rows of characters] running sideways on [stiff] leather, to serve as records. West of this country is T'iau-chï; north is An-ts'ai.

One observation in particular reveals the quality of attention that Zhang Qian brought to observing everyday life: "When I was in Ta-hia [Bactria]," he told the king, "I saw there a stick of bamboo of Kiung [Kiung-chóu in Ssï-ch'uan] and some cloth of Shu [Ssï-ch'uan]. When I asked the inhabitants of Ta-hia how they had obtained possession of these, they replied: 'The inhabitants of our country buy them in Shon-tu [India].'" Wudi, impressed by the active trading systems and range of goods that Zhang Qian's report described, tried to follow his recommendation and forge routes to India and Bactria that did not pass through the lands controlled by the steppe nomads. This enterprise failed, but Wudi extended the northern wall far to the west and founded garrisons and trading posts. As trade expanded, the Chinese obtained Indian spices and cloth, Roman glass, and other exotic goods—as well as further knowledge about the kingdoms that produced them. Embassies also continued to be organized and dispatched. As Xin Wen has shown, they too formed networks that transported material gifts and useful knowledge across boundaries, often confronting great hardships. Information made the Silk Road.

It also traveled. Languages and knowledge of languages expanded. Chinese, for example, rapidly became a language of world trade. Trading centers became zones where several languages might be in use. Palmyra, for example, was a

caravan oasis northeast of Damascus. Once Petra was conquered by Rome, Palmyra became a dominant node in the caravan routes that brought goods to and from the Persian Gulf. The city established garrisons and trading sites in other cities. Many Palmyrenes spoke Aramaic, the lingua franca of the eastern Mediterranean, and wrote it in a distinctive alphabet. Others used Arabic, and still others were conversant in Greek and the Iranian language of the Parthians. In Dunhuang, a city of some thirty thousand inhabitants near the border with Tibet, forty thousand surviving scrolls reveal that the languages used there included Tibetan, Sanskrit, Chinese, Sogdian—and, as attested by one scroll, Hebrew. In this small but cosmopolitan community, as Jacob Mikanowski has noted, "Buddhists rubbed shoulders with Manicheans, Christians, Zoroastrians, and Jews, and Chinese scribes copied Tibetan prayers that had been translated from Sanskrit by Indian monks working for Turkish khans."

Cultural practices and styles moved as far—and as erratically—as words, transmitted by the artisans who made them, by the products that embodied them, and, above all, by missionaries and other migrants. Palmyra was constructed as a magnificent Greek city. Its main trading street ran between immense colonnades built in three stages, more than a kilometer long, supported by several hundred Corinthian columns. At its core were an agora, a theater, and a senate house. The reliefs on the sarcophagi of its wealthy inhabitants showed them reclining, like Greeks, on couches and drinking from goblets. They were following the practices of the Greek symposium, a fundamental part of social life. Yet they dedicated their main temple to Bel, a Semitic god, and—unlike the cities of Hellenistic and Roman Egypt and Syria—never developed a local culture based on the Greek language; nor did they build the gymnasium that was as central to Greek cities as the agora was. Followers of Nestorius, a fifth-century theologian, carried Christianity all the way to China; fleeing condemnation by the church council of Ephesus in 431, they established a separate church in Persia. In 781, Nestorians described the history of their church in China in a long inscription on a stele in the inland city of Xi'an, which was both the terminus of the Silk Road and the capital of the ruling Tang dynasty. They told their story in Chinese and placed special emphasis on both the imperial favor that had allowed them to proselytize and the pursuit of perfection and purity, which they treated as the core of Christianity. Yet even they were no more skillful in portraying themselves in the languages of distinct cultures than the Sogdian officials in sixth-century Xi'an, whose families commemorated them with monuments in both Sogdian and Chinese, which emphasized completely different traits and accomplishments. It is often hard to

know what a particular style of building or sculpture, hair or clothing, or a particular turn of phrase in a second or third language, meant to those who enthusiastically adopted them.

Technical information—especially about the goods traded on the silk and spice routes—traveled these roads as well. Surviving letters written by Sogdian traders in the fourth century offer little information about markets beyond brief lists of goods for sale in a particular locality. It seems that trade on the Asian silk routes was often relatively modest in scale, conducted by peddlers. But monks also traveled these routes, as we have seen, bringing elaborate scriptures and complex doctrines with them. Sometimes their packs may have included much more. In the middle of the sixth century, according to the Byzantine historian Procopius, "there came from India certain monks; and when they had satisfied Justinian Augustus that the Romans no longer should buy silk from the Persians, they promised the emperor in an interview that they would provide the materials for making silk so that never should the Romans seek business of this kind from their enemy the Persians, or from any other people whatsoever" (*History of the Wars* VIII.xvii.1–2). Justinian had long planned to cultivate silk, and archaeological evidence suggests that sericulture, like the fashion for silk garments, had spread from China over the centuries. Once the monks—or someone else—provided the silkworm eggs, the emperors made Byzantium a western center of silk manufacture, which remained an imperial monopoly. Brilliantly colored silks, stitched with gold designs, served for centuries to come as material for court garments and as gifts to foreign powers. Like the transfer of religions, the transfer of technologies was often encouraged by royal authority.

The trade routes that carried spices—and, eventually, silks—across the Indian Ocean and up the Red Sea were also polyglot and cosmopolitan. They carried the spices that gave food in Rome and medieval and *early modern Europe its sharp, varied flavors. At first, spices arrived with little cultural framework. The Roman natural historian Pliny, writing in the first century CE, complained that "pepper has nothing in it that can plead as a recommendation to either fruit or berry, its only desirable quality being a certain pungency; and yet it is for this that we import it all the way from India" (*Natural History* XII.xiv.29)—though even Pliny recommended it for many medicinal uses. The scale of the trade, at its height, was immense. A single ship, the *Hermapollon*, which sailed from India to Alexandria in the second century CE, carried more than 500 tons of pepper, as well as Gangetic nard, ivory tusks, and other goods. Over time, spices were discovered to have multiple preferred

functions, as Greek and Arabic medical writers observed their effects. By the eleventh century, Constantine the African—a Muslim physician from Tunisia, steeped in the traditions of Arabic medicine, who ended his life as a Benedictine monk at Monte Cassino in Italy—revealed to readers in the Latin world that cloves, ginger, cinnamon, anise, and several other spices could remedy sexual impotence.

Those who traveled the long distances of the spice trade collected technical information, to an extent not documented for their counterparts in central Asian caravans. In the middle of the first century CE, a Greek-speaking merchant captain based in Egypt took the time to write down, in spoken rather than literary Greek, a record of the useful knowledge he had accumulated in his time as a trader. The *Periplus [Coasting Voyage] of the Erythraean Sea* is, first and foremost, a practical guide to navigation and trade. It moves from the Egyptian ports where the author was based south along the Red Sea. The author describes natural features, ports, and markets on the Horn and southeast coast of Africa, in Arabia, and in the Indian subcontinent. He also makes clear how dangerous expeditions across the oceans that separated them could be. A captain had to be in command not only of the prevailing winds, which carried ships across the Indian Ocean in both directions, but also of the challenging geography of many coasts: "To set a course along the coast of Arabia is altogether risky, since the region with its lack of harbors offers poor anchorage, is foul with rocky stretches, cannot be approached because of cliffs, and is fearsome in every respect." Even major ports could be dangerous. At Barygaza, a major entrepôt on the west coast of India, the tides "are much more extreme . . . than elsewhere." The flood tide, which was so powerful that it made the seafloor visible, overturned small ships and grounded larger ones on the shoals.

But the *Periplus* spends much more time on the opportunities for trade available in the "designated harbors"—the cities where established trade routes met and permanent markets flourished. To reach Barygaza from Egypt, one had to set sail in July. There one could sell wine from Italy, Laodicea, and Arabia; copper, tin, and lead; coral; and textiles and clothing; as well as silverware, unguent, and female slaves for the ruler. Exports included ivory, onyx, Chinese silk and silk yarn, and pepper, but "Roman money, gold and silver, which commands an exchange at some profit against the local currency," could also be traded. Passages like these make clear how rich and varied the major markets were: Barygaza served both the silk and the spice trades and many others. Such passages also reveal the striking range of knowledge a trader needed: mastery

of exchange rates and knowledge of both valuable exports and desirable imports in multiple different trading zones.

Above all, the trader had to be able to make expert judgments of a vast range of goods. In the course of the *Periplus*, the author evaluates the quality of cloth, garments, nard, incense, tortoise shell, and slaves available in different markets. Evidently, he and his colleagues had to cultivate skilled eyes and hands in order to learn the preferred colors, weights, and textures of many forms of goods and to subject the goods offered them for sale to expert scrutiny. When Columbus interrogated the inhabitants of Cuba and scrutinized their ornaments and the plants they brought him, he was practicing skills and depending on knowledge developed long before in the silk and spice trades.

Traders were curious. In the course of their voyages, they learned something of the methods used to create the products they bought and sold. The *Periplus*, which devotes close attention to the "frankincense-breeding land" of Yemen and the resins produced there, describes their production in grim, unsparing detail: "The frankincense-bearing trees are neither very large nor tall: they give off frankincense in congealed form on the bark, just as some of the trees we have in Egypt exude gum. The frankincense is handled by royal slaves and convicts. For the districts are terribly unhealthy, harmful to those sailing by and absolutely fatal to those working there—who, moreover, die off easily because of the lack of nourishment." This is probably accurate. Even now the desert highlands where frankincense is harvested are forbidding, and those engaged in the harvesting are said to live ascetic lives while at work. Pearl diving in India, the *Periplus* notes, was also "carried out by convicts."

Occasionally, the text provides information that is not strictly practical. For example, it describes an Indian shrine: "men who wish to lead a holy life for the rest of their days remain there celibate; they come there and they perform ablutions. Women, too, do the same. For it is said that at one time the goddess remained here and performed ablutions." More often, the author reports information about inland markets and the trades performed there, which could derive from conversations in the port city markets he frequented rather than direct experience. For example, he describes the yearly fair held at the border between northeastern India and Tibet, attended by people whom he calls Sêsatai, who "come with their wives and children bearing great packs resembling mats of green leaves and then remain at some spot on the border between them and those on the Thina side, and they hold a festival for several days" and provide the locals with the materials for making malabathrum, balls of dried leaves from cinnamon-like plants, in three distinct grades. Officials

and merchants from other societies had eyes as sharp as those of the author of the *Periplus*. In southern India, in the years when he was plying the Indian Ocean, a literary work recorded the striking presence at Arikamedu, near modern Pondicherry, of "abodes of [Romans], whose prosperity was never on the wane. On the harbor were to be seen sailors come from distant lands, but for all appearance they lived as one community."

Much remained unknown. The author of the *Periplus* broke off his account after describing the Tibetan fairs: "What lies beyond this area, because of extremes of storm, bitter cold, and difficult terrain, and also because of some divine power of the gods, has not been explored." He thought of China as a land to the north of India and mistakenly believed that the Greek kingdom of Bactria still existed in his time. Misinformation derived from tradition as well as from misunderstood experience. Ancient myths survived into modern collections of information. The monsters that Columbus expected to find in the Indies had first been described not by traders or soldiers but by Greek writers, Ctesias and Megasthenes, from whom a Roman authority on natural history and ethnography, the elder Pliny (d. 79 CE), took them over into his own compendium, the *Natural History*. Yet as Columbus's interest in them suggests, traders and sailors undoubtedly included such creatures, as well as information about winds and coasts, currencies and goods for sale, when they told tales and advised the young. To put the information that moved down these networks to practical use always required a critical mind and a quick wit.

Empire and Information: The Case of Rome

The description of the kingdom of Da Qin—possibly Rome—in the Chinese dynastic histories includes some striking details. Da Qin has four hundred walled towns and many dependent kingdoms. The walls are made of stone. More impressive still, "at regular intervals, it has built postal relay stations, which are all plastered and whitewashed." The king moves every day from one of his five palaces to another, giving justice, and "each palace has a staffed archive." In these passages at least, the kingdom in question sounds like Rome. It is a massive empire, a mosaic of towns and nations under the rule of a single monarch. And it makes provision—extensive provision—for receiving inquiries and pleas from the citizens of those lands and communicating its decisions to them. A postal service and a system of archives are both in place, to conserve and move the documents on which this kingdom seems to run. The Chinese—who built their own formidable road system and bureaucracy, which managed

immense amounts of information—were naturally sensitive to these features of Roman life. But they were not the only observers to note the sheer mass of record keeping that Roman government required. A Jewish scholar who lived in the Babylonian town of Sura, under Roman rule, is reported to have made the same observation: "Rav said: Even if all the seas were ink, and the reeds were quills, and the heavens were parchment, and all the people were scribes; all these are insufficient to write the intricacies of governmental authority" (*Babylonian Talmud Shabbat* 11a). Chinese and Jewish observers were both right. Rome functioned as much by its systems of records and communication as by its armies and navies.

The Roman Empire—which grew, first through Italy and then, in the last century BCE and the first century CE, into Gaul, Egypt, England, and beyond—covered a staggeringly large and varied territory. At its height, according to the Stanford ORBIS project, which has created "a geospatial network model of the Roman world," it "ruled a quarter of humanity through complex networks of political power, military domination and economic exchange" that covered one-ninth of the world's surface. These vast land holdings were wrapped around an enormous inland sea. As Fernand Braudel, a pioneering historian of the Mediterranean, argued long ago, distance was the enemy: it constantly hindered the exertion of political power and military force in predictable time spans.

Rome's leaders fought distance from the start of the city's rise to power. They constructed a system of roads that eventually extended from the city of Rome east to Constantinople and then to Trebizond; to the west across Gaul to London and then to northern Britain, and across Iberia to Gades, at the entrance to the Mediterranean. Across from Gades, another road system began in Banasa, in what is now Morocco. This ran eastward, along the southern shore of the Mediterranean, to the Levant, and joined the northern system of roads in Syria. Republican magistrates had begun constructing the Italian part of the system, not only building roads but also lining them with milestones to mark distances. But the emperors built the great roads that connected the parts of the empire. The system consisted, at its peak, of 372 roads, more than 400,000 kilometers in total length. (By way of comparison, the American Interstate Highway System is 78,465 kilometers long.)

Though forms of paving varied, tens of thousands of kilometers were paved with cut blocks of stone or lava resting on layers of earth and rubble. Roads were cambered—made convex—so that water would run off into the drainage ditches that flanked them. Rows of curbstones held the layers of pavement in

place. Oak pilings made it possible to build roads across marshy land. Stone bridges supported by piers carried roadways directly across rivers and valleys. The longest of these runs 2,437 meters. The section of it that spans the bed of the Danube is 1,137 meters long. Roads were built, largely, by the Roman armies, using the same engineering skills seen in their camps, pontoon bridges, and siege weapons, but slaves and prisoners of war were also conscripted to work on them. Once these vast projects had been completed, local magistrates were responsible for maintaining them from their own funds or by raising taxes. This system functioned well for centuries. Many of the roads survive to this day.

Roman roads were open to all: to the Roman military and officials, but also to merchants and ordinary citizens. From the start, though, they existed to carry information, as well as to project military power and support trade and travel. Suetonius, the biographer of the early Roman emperors, records that the first of them, Augustus, systematically reorganized the *cursus publicus*, or postal service: "First he set young men at reasonable intervals on the military roads, then he placed vehicles there, so that what was happening in each province could be known as swiftly as possible." He added the vehicles in order to receive and analyze important news as soon as possible: "This seemed the most convenient way, so that those who brought a letter from a given place could be questioned about it, if necessary" (*Life of Augustus* 49.3). When the system was complete, couriers (*tabellarii*) riding horses or post carts carried the news, changing horses at designated changing places (*mutationes*), ten to twenty kilometers apart. Full rest stops (*mansiones*), set a day's journey from one another, offered lodging, artisans, veterinary surgeons, and police, to support the couriers.

Imperial power also depended on travel by water. The empire included navigable rivers and canals that stretched some 28,000 kilometers, and its oceangoing ships followed hundreds of routes in the summer sailing season. Roman ships could carry substantial cargoes—up to three thousand amphoras, or 150 metric tons. Thanks to Rome's hold on the Mediterranean littoral and to its vast naval power, travel by ship was safe and, by historical standards, inexpensive. Emperors, accordingly, often chose to send crucial dispatches and instructions by ship. Fleets carried hundreds of thousands of tons of Egyptian grain to Pozzuoli in Campania: the philosopher Seneca describes the eager crowds, greeting the mailboats that arrived first and announced the coming of the larger fleet.

Imperial authority rested on this immense communications network. Political changes and military developments in, around, and outside the

Roman world had to be observed. Decrees, legislation, and verdicts that affected the empire's immense and scattered body of citizens and subjects had to be circulated. From the time of Julius Caesar, scribes prepared and posted the *Acta diurna*: an official record of important events. This began as a record of deliberations in the Senate and the assemblies of the people but expanded to include news of major bequests, prodigies of nature, and victories of gladiators. When Cicero was away from Rome, he followed events in the *Acta*, complaining that they contained too much trivial matter. He was not wrong. A century later, the emperor Caligula not only recorded good and bad ratings for the married women with whom he had sex but in some cases made out bills of divorce in their husbands' names and "ordered that they be inserted into the *Acta*" (Suetonius, *Life of Caligula* 36.2). Still, the *Acta* did much to make the operations of government visible, if not transparent.

Roman emperors did not provide, or promise to provide, much of what even an austere modern government might offer: public education for all, health care, security in old age. But they did need to maintain armed forces around the empire: soldiers had to be equipped and paid. Citizens of Rome, moreover, were entitled to "bread and circuses"—a ration of wheat and free entertainment. Citizens and subjects across the immense empire had to be taxed to cover this vast expense. Surviving documents from Egypt show that local officials kept careful registers of landownership, which noted the legal status and state of cultivation of each plot. *Coded marginal annotations—a single letter or a pen stroke—indicate that these records were consulted and used, though their exact meaning is unclear. When an official suspected that a given landowner was not paying a proper share, he could check the tax return in question against census records. The same officials also recorded troop movements and accommodations and ordered shipments of the materials they needed.

At a higher level, the imperial government in Rome regularly promulgated edicts, issued other official documents, and provided verdicts on legal cases appealed to the highest authority. Archives in Rome and in the provinces stored these documents. Requests for new copies regularly reached Rome and shed light on the procedures used to produce and validate them. In 39 BCE the city of Aphrodisias in Anatolia sent an ambassador to Rome, partly in order to obtain copies of four distinct documents. Octavian—not yet Augustus—replied, sending a letter to which the copies were attached. When the city government received the emperor's communication, it gave orders that both Octavian's reply and a senatorial decree should be recorded in public inscriptions.

The whole system required the employment of many scribes, as well as skilled artisans who could inscribe texts on stone or bronze tablets.

Given the distances between cities—and between the provinces and Rome—such documents had to bear clear signs of their authenticity. References to archival practices were common. Octavian, writing to Aphrodisias, noted that the copies he forwarded came "from the public records," and he expressed his "wish" that the citizens of Aphrodisias would "register them among your public records." Many surviving documents contain declarations that they were "copied and approved," or statements that "I have signed it. I have approved it"—presumably to be attributed, as Clifford Ando has shown, not to the emperors who appear as the authors of the decrees in question but to the scribes who copied them. Roman magistrates also took responsibility for making new legislation known to the empire's subjects. Gradually, uniform procedures developed. Even in the Republican period, the governors of the vast Roman provinces sent copies of decrees or instructions to all major cities, with orders that they be inscribed on stone pilasters "in the most conspicuous place, so that justice might be established for all time uniformly for all the province." Under the principate and empire, these became the norms for imperial decrees as well. Even matters not important enough to be preserved on stone had to be formally announced. A standard principle stated that no one could be held accountable to obey a new ordinance until it had been posted—normally in the form of a text on *papyrus or wood—for at least thirty days.

The empire, in short, built a sophisticated system for producing and distributing official documents—one whose vast Roman core was mirrored in part by local archives and workshops. Yet it would be wrong to imagine that this system embraced all the tasks of government. Around 110 CE, the emperor Trajan appointed the younger Pliny, the nephew of the natural historian, as governor of Bithynia in Asia Minor. Pliny repeatedly passed the buck, forwarding requests from the citizens of his province to the emperor: "It is my custom, Sire," he remarked, his tail wagging as he dictated his letter, "to refer to you in all cases where I am in doubt, for who can better clear up difficulties and inform me?" (*Letters* X.xcvi.1). Pliny would not give permission for Prusa to build a new bath or Nicomedia to create a fire department until he had asked Trajan's assent (which was forthcoming for the former, not for the latter). When he encountered followers of a new superstition, some of them denounced by informers, he reported in detail to the emperor. Pliny composed what remains the earliest description of a Christian service, which he confirmed by torturing two deaconesses: "they declared their guilt or error was

simply this—on a fixed day they used to meet before dawn and recite a hymn among themselves to Christ, as though he were a god. So far from binding themselves by oath to commit any crime, they swore to keep from theft, robbery, adultery, breach of faith, and not to deny any trust money deposited with them when called upon to deliver it. This ceremony over, they used to depart and meet again to take food—but it was of no special character, and entirely harmless" (X.xcvi.7). What matters most about these letters, for our purposes, is the manner of their survival. The road system made it possible for the governor and the emperor to discuss official business, at the slow pace that distance required but still in detail, reflecting the granular, prosaic nature of everyday administrative work. These texts are cast in an economical, formulaic language, which enabled Pliny to report *facts, express his uncertainty about how to deal with difficult cases, and ask for advice. The emperor's replies include friendly if patronizing personal letters to his trusted governor and official rulings. "The correspondence between Pliny and Trajan," comments Kathleen M. Coleman, "lets us overhear two bureaucrats running the empire at an absolutely nuts-and-bolts level." But their surviving correspondence was not simply preserved—so far as we know—in an official archive. Pliny himself included it as the tenth book of his letters, which he may have collected and redacted from his own records, inserting the emperor's replies in the proper places, omitting many attachments mentioned in the texts, and deleting what he saw as superfluous or potentially awkward details. Some scholars have argued that Pliny assembled this collection, with Trajan's permission, to serve as a portrait of the empire in action. In this case—and in dozens of others—important documents were created and preserved in ways that suggest that important Romans saw them as their private property.

Information gathering in the empire as a whole, moreover, depended on multiple systems. The elder Pliny served the emperor Vespasian in multiple capacities. He died doing his job as prefect of the fleet, trying to rescue friends from the eruption of Mount Vesuvius—and to study it close up—in August 79 CE. He believed in seeing for himself. But in compiling his enormous *Natural History*, an *encyclopedic survey of the wonders of nature and art—especially those of the Roman Empire—he drew his information chiefly from written sources, which he listed. He probably worked from the immense notebooks full of excerpts that, the younger Pliny tells us, he assembled, using the help of enslaved scribes. Despite his official position, Pliny often compiled facts and traditions passed down in ordinary texts: for example, the descriptions of the monstrous races to be found in India. From Augustus on, Romans liked to

suggest that they had conquered, and knew, the whole world. Yet Claudius Ptolemy, who folded thousands of place names and vast amounts of other information into the maps and text of his atlas, the *Geography*, in the second century CE, depended on written sources and his own conjectures for his knowledge of the Indian Ocean and seems to have had no access to military maps and itineraries, which often would have allowed him to correct his own work.

The efficiency and comprehensiveness of the Roman information state, in short, were anything but absolute. The entire corps of Roman officials numbered no more than thirty thousand to thirty-five thousand—just over a quarter as many as are employed by the US Department of Justice. Even the most important documents were not systematically classified and preserved. The first full collection of imperial edicts, the Theodosian Code, was not commissioned until 429 CE: it was promulgated nine years later. The Senate saw to it that carefully prepared official copies were dispatched to multiple archives. So far as its sources were concerned, though, it was a patchwork. The committee that composed it had to scour local as well as central archives, family papers, law school libraries, and other collections to find the texts of the emperors' proclaimed new laws. Transport of documents—though rapid by ancient standards—was often too slow and too unpredictable to have the desired effect. The last letter that the emperor Caligula sent to Publius Petronius, the governor of Syria, who had disobeyed what he thought an unreasonable command, threatened him with execution. Fortunately for Petronius, the Jewish historian Josephus explained, "It happened that the carriers of Caius [Caligula]'s letter were caught in a storm for three months on the ocean, while the others that brought the news of Caius's death had a good voyage. Accordingly, Petronius received the letter concerning Caius twenty-seven days before he received the one against himself" (*Jewish War* II.203).

Yet the system functioned for centuries. Early in the fourth century, Eusebius of Caesarea, a Christian bishop who had avoided martyrdom during the Great Persecution, wrote a triumphant history of the Christian Church. Later he would also write the life of the emperor Constantine, who had adopted the Christian God and religion. Both texts were unusual, because Eusebius filled them with documents quoted word for word—a violation of the normal conventions of narrative history in Greece and Rome. He drew them from both the archives of the more established Christian churches—especially those in Jerusalem, not far from him—and the official archives of the Roman Empire. Eusebius has been accused by more than one historian of passing off forgeries in the documents in his life of Constantine. Yet one of these has now turned

up in an independent copy on papyrus, and current opinion is that it is genuine. In one case, Eusebius even stated that he was citing his text "from an authenticated copy of the imperial edict preserved in my possession, on which the personal subscription, by Constantine's right hand, signifies its testimony to the trustworthiness of my speech" (Eusebius, *Life of Constantine* II.23). Clifford Ando maintains that Eusebius saw himself as following Roman practice when he emphasized that his histories rested on authentic documents. And it is certain that he knew and used the imperial information system. When the emperor asked Eusebius to have his *scriptorium produce fifty large Bibles for the new churches of Constantinople, he sent the necessary *parchment—too much for even a rich bishop to provide—by the post carts of the *cursus publicus*. And when Eusebius himself compiled his work on the topography of Palestine, he drew on military records for the positions of towns and the directions of roads. No wonder that Chinese and Jewish observers, like Eusebius, found much to admire in Rome's imperial information culture.

In one respect, though, Eusebius's admiration was qualified. When he quoted his official copy of Constantine's letter, he explained that "I think it well to insert [it] here as connected with my present subject, in order . . . that a copy of this document may be recorded as matter of history, and thus preserved to posterity." The implicit point of this remark is clearly true. The archives that held the emperor's letters have disappeared, taking the vast majority of their contents with them. Yet Eusebius's literary work remains, attesting to the power of writing and the materials on which it is inscribed to preserve what governmental power could not.

Fragile Infrastructure: Paper

Writing materials, like trade, are ancient and varied. More than two thousand years ago, the Chinese were the first to realize that plant fibers, now known as cellulose, could be beaten, mixed with water, and then left on a screen to drain until a sheet of paper remained. This practical discovery changed the world. Millennia before anyone knew what cellulose was, papermakers separated it strand by strand from wood and silk, cotton and seaweed, and devised a writing material that is still cheaper and more adaptable than any other. The Chinese themselves had long since developed elaborate systems for incising their characters on bones and tortoiseshell, and for writing them with ink on strips of bamboo, as well as for inscribing them on bronze bells and cauldrons and on boulders. But paper rapidly showed its advantages. It could be created from

different raw materials, from various plants to waste rags, and in many different forms and qualities. Brilliant white paper made from the bark of paper mulberry was used for the largest scrolls; bright green paper, perhaps from mulberry bark, for writing; white rattan paper for the Inner Chamber edicts of the Tang government. Paper could also be used for many purposes, from wiping the nose to doing the same for the rear—a use attested by the sixth century (for its later diffusion see Fitzgerald and Nappi, chap. 3).

Made from inexpensive materials, paper could be produced in sufficient quantities to be used for printing. For millennia the Chinese had used seals to make impressions of reverse images with ink. They also found paper useful for taking rubbings, for copies of reliefs, and inscriptions. By the beginning of the seventh century, carved woodblocks were in use to print images and characters on paper. During the Tang (618–906) and Song (960–1279) dynasties, woodblock printing became more widespread. At first it was used chiefly for practical works, such as medical texts and almanacs. By 868, a Chinese translation of the Diamond Sutra, a Buddhist text on the pursuit of perfection, had been printed. The only known copy of it, now in London, was found, appropriately, at Dunhuang. Over the centuries to come, wood-block printing would become the standard method for reproducing Chinese texts of every kind, from the classics and the commentaries on them to novels. At first, the government dominated production, but during the Song dynasty, commercial printers also appeared, competing to take over the market with what they and their editors described as critical editions, produced by comparing many versions of the classic texts, preserved in academy libraries. Though printing with movable metal type was also invented in China, in the eleventh century, wood-block printing, which was cheaper and made reprinting easy, remained the standard method. Printing moved from China to Korea and then to Japan. There too it sparked innovation. By the fourteenth century, Korean books were being printed with movable metal type.

"The Silk Road," as Lothar Müller observed, "was also a paper road." In the eighth and ninth centuries, Chinese paper texts bearing everything from inventories to short Buddhist scriptures traveled as far as the Caucasus Mountains, near the Black Sea. More important, the methods of papermaking also traveled. By the time the storeroom at Dunhuang was closed off, it contained thousands of documents, from astrological charts to scriptures: hundreds of them are written on paper. The new religion of Islam took shape—and its followers captured vast territories, from central Asia to Spain and Africa—in the seventh and eighth centuries. At first, Muslims used the writing materials

that had been most common in the ancient Mediterranean. Scribes normally used parchment, the writing material made from the skins of sheep and calves, for the Quran. Egypt was the home of papyrus—the paper, made from reeds that grew in the Nile, that had been the standard writing material for ancient Greece as well as Egypt. It found use in bureaucratic documents, as the new government grew.

But paper had much to offer the followers of Islam. The Chinese had already found that rags, as well as bark, could be turned into paper. In central Asia and beyond, mulberry bark was not available. But used clothing and cordage were. As great new cities took shape at Baghdad, Damascus, and elsewhere, paper mills were created. They took advantage of a ready-made wealth of raw material. Cheaper than parchment, which depended on the availability of livestock and required intensive preparation, more flexible and durable than papyrus, paper could be used for many purposes. The fifteenth-century historian Ibn Khaldūn explained that a vizier who had served the caliph Hārūn al-Rashīd, eight hundred years before, sponsored the manufacture of paper in Baghdad because parchment was in short supply. His decision, Ibn Khaldūn held, had transformed politics and culture: "paper was used for government documents and diplomas. Afterwards, people used paper in sheets for government and scholarly writings, and the manufacture [of paper] reached a considerable degree of excellence."

Gradually paper did become the writing material of choice, for the Quran and other texts as well as for government registers and inventories. Paper mills spread across the Islamic world, all the way to Iberia. New techniques were developed. Rags had to be beaten before they could be spread across the racks to form paper. The mills of Samarkand, in modern Uzbekistan, used water to power mechanical hammers, known in the West as stampers, to carry out this part of the process.

The ready availability of paper, as Jonathan Bloom has shown, transformed possibilities in many fields. Though the Quran always remained as much an oral as a written text, meant for recitation, a world of commentaries and further traditions grew up alongside it, recorded—like the Quran itself—on paper. Another vast world of philosophy and *philology, based on translations from Greek into Syriac and from Syriac into Arabic, grew up in fields from medicine to metaphysics. Imaginative writers began to rework stories and fables into works on a grander and more elaborate scale—like the *Thousand and One Nights*, the title of which appears on one of the earliest Arabic documents to survive, a ninth-century fragment preserved in Chicago.

Muslims learned to compute, using Arabic numerals, with pen and ink on paper rather than an abacus or dust board. Cartographers who revived and expanded the techniques inherited from the Greek and Roman world made their maps on paper. Architects used paper to draw up formal plans for buildings. Paper, the nomadic medium, provided essential aid to societies that were remaking themselves in the pursuit of many forms of knowledge. It made possible the founding of libraries from Damascus to the Abbasid *"House of Wisdom" in Baghdad and the tenth-century library of Caliph al-Ḥakam II al-Mustanṣir in Cordoba, and the flourishing of book markets like the one that Ibn Baṭṭūṭa found in fourteenth-century Damascus, near the great Umayyad Mosque, and the one in Istanbul, still the largest in the Mediterranean world in the seventeenth century (see Muhanna, chap. 2). On a more basic level, it provided vital infrastructure for the growth of the trade networks documented by the thousands of letters and contracts, court documents, and pilgrim records, fragments of which were stored in the Cairo Genizah, the storeroom of the Ben Ezra Synagogue in Old Cairo—networks that stretched from Morocco to India.

Paper mills were not altogether good neighbors. They were noisy; they processed vast piles of dirty rags, collected by male and female ragpickers; and they stank of ammonia, often derived from human urine, which was used to break down the rags' fibers. Neighbors hated them. Yet their workers developed extraordinary skills, working "so quickly and with such agility that you can scarcely see their hands." More important, they produced something mysteriously strong and beautiful. As an observer wrote on visiting a paper mill in seventeenth-century Genoa: "the way paper is made is a marvelous thing, because, as we have said, the materials from which it is made are merely rags and water, which have no viscous or resistant qualities, and yet the sheets of paper made from them have such consistency that they are better than cloth."

Some early reactions to paper in Christian Europe were negative. Peter the Venerable complained around 1144 that Jews wrote on a material made not, as it should be, from animal skins, but from "scraps of old rags or even viler stuff." A century later Emperor Frederick II forbade its use in official records. Others, however, adopted it eagerly. Once King Jaume the Conqueror had fought his way to mastery of the Iberian coastal realm that he called the kingdom of Valencia, his government produced thousands of documents. More than ten thousand of them, written between 1257 and 1276, are now preserved in twenty-nine immense volumes. From the start he issued charters in paper as well as parchment, to Christians as well as Muslims, using the products of the Muslim paper

mill at Játiva and then establishing his own mill. Soon paper mills opened in southern France and in Fabriano in the Italian Marches, where wire molds produced paper with handsome surface patterns and distinctive watermarks.

Innovation never stopped. European technology for making scissors improved in the fourteenth century, making it possible to cut the rags that went into paper more evenly. So did methods for wire drawing, which enabled papermakers to make finer sieves than ever before, with which they could produce an absolutely smooth form of paper. European papermakers devised a way to size paper with gelatin, giving it a smooth surface that was impervious to ink and resisted abrasion and soiling. Many grades of paper were available. When the Nuremberg printer Johannes Petreius was trying to convince Erasmus Reinhold to publish with him, he promised that his work would appear on "fine crown paper." Early printers used parchment for deluxe copies of particular books. But Vincenzo Conti, who owned the press at Cremona, did not need to have animals skinned when he brought out the first three-volume edition of the *Zohar*, the core text of the kabbalah from 1558 to 1560. Instead he followed a precedent set by Aldus Manutius and later applied to Jewish texts by Daniel Bomberg and used a rich blue paper for some copies.

By the fourteenth century, paper played a substantial role in book production in the Latin West. Most authors preferred parchment, especially for the fine presentation copies of their works destined for patrons. Some thirty extant documents contain Petrarch's handwriting. Only two are on paper. A generation later, Christine de Pizan still chose parchment for the splendid *illuminated copies of her French writings. In them she herself appeared, wielding the penknife with which she would have both sharpened her quill and scraped away slips of the pen. But secular scribal work was expanding, in city governments and state bureaucracies. *Vernacular literature of all kinds was being written and copied. The Latin literature of the humanists was also finding a larger market. Several of the translations and treatises of the most popular fifteenth-century humanist, Leonardo Bruni, are preserved in two or three hundred manuscript copies each, all, or all but a handful, written on paper. Paper production grew to meet the need, and more—so much so that it began to dominate the Muslim as well as the Christian market. In 1409 a worried client asked the Maghrebi jurist Ibn Marzūq for a formal opinion on whether a devout Muslim could use Christian paper—particularly Christian paper with a watermark that might include Christian symbols—for the Quran and other texts. In an elaborate fatwa, Ibn Marzūq argued that one could. The holy text, after all, transformed the mere medium that held it.

Paper made possible the rise of movable-type printing in Europe in the fifteenth century, which is treated in detail below (Blair, chap. 4). But it made other developments possible as well. A vast expansion of writing took place at the same time as printing, which became the dominant form of publication. Even as printers filled the world with books, governments invested in vast new paper management systems, diplomats filed endless reports in cipher, impresarios produced handwritten newsletters for select clients, and scholars devoted their lives to filling notebooks with excerpts taken from the vast production of the presses and systematically classified. The age of Gutenberg was also the age of the "paper king," Philip II of Spain, who took to signing documents with a stamp and waved them around at meetings like a *Renaissance Joseph McCarthy (Head, chap. 6).

It seems completely appropriate that Columbus, trying to understand what he was seeing in the Indies, used pen and paper as his tools. In this as in other ways, he was the heir of generations of travelers and traders, missionaries and skippers. Some of their ways would soon be transformed beyond recognition. Others continued to rest on foundations laid long before and far away.

Further Reading

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INDEX

Page numbers in italics refer to figures