In ancient times writings and inscriptions were generally made on tablets of bamboo or on pieces of silk. But silk being costly and bamboo heavy, they were not convenient to use. Cai Lun then initiated the idea of making paper from the bark of trees, remnants of hemp, rags of cloth, and fishing nets. He submitted the process to the emperor in the first year of Yuan-xing (105 C.E.) and received praise for his ability. From this time on, paper has been in use everywhere and is universally called the paper of Marquis Cai. — *Hou Han shu* (History of the Later Han Dynasty)

Humans have been around for five million years. For 99.9 percent of that time, or until about five thousand years ago, they did not write at all. The invention of writing around 3000 B.C.E. transformed human society by enabling people to transmit greater quantities of knowledge more accurately across vast distances of space and time. In spite of the power of writing, however, or perhaps because of it, for many centuries writing and reading were skills limited to a relative few. Truly literate societies, where a significant proportion of the people regularly read and wrote, did not evolve for several thousand years. Writing developed in some centers of ancient civilization, but the transformation to literate society was accomplished only with the help of paper, a writing material invented in China about two thousand years ago. Nevertheless, it was not the Chinese who exploited the potential of paper in this way, but the Muslims of West Asia, beginning in the ninth century. Their use of paper for writing inaugurated "a new era of civilization, the one we live in now," as the historian Alfred von Kremer wrote more than a century ago.

Paper, now used universally to write and print any language or message because it is light, flexible, strong, and inexpensive, was invented not for writing but for wrapping. The discovery that it was suitable for writing took many years. Before that discovery—namely, for the first three thousand years of writing—most writers used styluses, reed pens, brushes, stamps, or impressing tools to write on clay tablets, papyrus sheets, and bamboo strips. Writers certainly used other materials to write on, including bark, leaves, cloth, and skin, but these, being more fragile, have not survived the centuries, and we know about them only indirectly. The nature of the materials—soft, flexible, or absorbent—and the different tools developed for marking them gave the first writing systems—those of the Mesopotamians, the Egyptians, and the Chinese—their distinctive characteristics. These characteristics differentiated the scripts and the ones that evolved from them even after all the scripts came to be written on paper.
CLAY TABLETS AND PAPYRUS ROLLS

The earliest known writing system was invented in Mesopotamia in the fourth millennium B.C.E., and other scripts were invented apparently independently in the Indus Valley in the third millennium B.C.E., in China in the second millennium B.C.E., and in Mesoamerica in the first millennium B.C.E. Writing developed in Mesopotamia—in the southern part, Sumer—at a time of rapid urbanization, population growth, the division of labor, and the evolution of political systems. To write, the Mesopotamians impressed soft clay tablets with signs for words and syllables using a wedge-shaped stylus. The signs were laid out in horizontal rows, which were read, like English and many languages today, from left to right and top to bottom. The shape of the tip of the stylus gave the script its characteristic appearance as well as its modern name, cuneiform (wedge-shaped; fig. 3). The tablets were dried and, depending on the importance of the inscribed text, sometimes baked in a kiln. Although cuneiform script evolved for use on soft clay, from earliest times it was imitated in formal writings cut into stone or metal, but there is no evidence that it was ever written with a pen or a brush.

In Egypt, by contrast, the development of writing was not associated with the use of a particular tool and a particular material. Although Mesopotamians

![Fig. 3. Mesopotamian clay tablet impressed with cuneiform writing, Uruk, c. 1750 B.C.E. British Museum, London (ANE 33236)](image-url)
seem to have inspired Egyptians to take up writing and even though plenty of clay was available in the Nile Valley, Egyptians did not generally use clay tablets or the wedge-shaped styluses used for writing in clay. Nor did they imitate the Mesopotamian system of writing with signs and syllables. Instead, they developed the picture writing known as hieroglyphic (from the Greek meaning "sacred carving"). The earliest evidence for hieroglyphic writing is found on a group of stone cosmetic palettes carved in low relief. One of them, the Narmer Palette in the Egyptian Museum in Cairo, which is dated 3000 B.C.E., is decorated with several registers of scenes celebrating the triumph of Narmer, the last predynastic king of Egypt, over his enemies. On either side, at the top, is a hieroglyphic representation of the ruler’s name flanked by horned heads.

The full hieroglyphic writing system, which combined logograms or pictures with determinatives to indicate grammatical function or pronunciation, seems to have emerged about this time, and examples of it are found on different materials: roughly incised on stone with details supplied in paint, delicately carved in stone (fig. 4), molded in relief on plaster, or drawn and painted in two dimensions on walls or papyrus rolls. Unlike cuneiform, hieroglyphics could be written (and read) from left to right, right to left, or top to bottom, with the characters facing either right or left, depending on the con-

![Hieroglyphic text running in different directions on the funerary stela from Tjetji's tomb-chapel in Thebes. The horizontal text is an autobiography, recounting his achievements and good character; the vertical text is a funerary prayer. First Intermediate Period (c. 2150–c. 2018 B.C.E.), 59½ x 43 in. (151.5 x 109.5 cm), British Museum, London (EA 614).](image)
PAPYRUS
The ancient Egyptians prepared a writing material from the stalks of the papyrus plant (Papyrus cyperus), a member of the sedge family, which grew in the uncultivated marshy areas of the Nile Delta. With increased cultivation of the land, by the nineteenth century the native reed had died out in the Nile Valley, although it flourished—and still flourishes—in the Sudan. The papyrus strain currently grown in Egypt was introduced from the botanical gardens of Paris in 1872.

Hieratic (priestly) script was a simplified version of hieroglyphic developed for use in daily life. In contrast to hieroglyphic, which could be carved or painted on a variety of materials, hieratic was intended for use on papyrus; it was written in carbon ink with a reed pen (fig. 5). Only rarely and at a late date was hieratic ever engraved in stone. Whether written horizontally or vertically, it was always written from right to left; eventually it came to be written only in horizontal lines. A third form of Egyptian writing, demotic (popular), was even more scribal, in that it used many abbreviations and ligatures—ways to shorten words and tie them together. Commonly used from the seventh century B.C.E. to the fifth century C.E., demotic script was derived from the “business” style of handwriting used in the Nile Delta. It was the presence of Greek, demotic, and hieroglyphic inscriptions on the Rosetta stone, discovered in the Nile Delta region, that enabled Jean François Champollion to begin the decipherment of hieroglyphic in the nineteenth century.

Although Egyptians wrote on many different surfaces, the distinctive way their writing evolved was mainly a consequence of how they chose to handle papyrus. Strips of papyrus reed were made into rectangular sheets, which were then pasted together into long rolls. The sheets were pasted right over left so that the scribe’s pen would not catch where the sheets overlapped. As papyrus sheets were relatively fragile at the edges or when folded, the roll format reduced the ratio of edge to surface and avoided folds altogether, although it allowed only one side of the sheet to be used. For rolls that received regular handling or for luxury projects, Egyptians also used leather, which was more durable.

The unusually dry climate of Egypt has preserved enough early artifacts that we have a remarkably complete overview of Egyptian writing. In addition to inscriptions on walls and statues and writing on papyrus rolls, texts were inscribed on woven linen used for offerings, shrouds, or mummy wrappings. Students normally practiced on rectangular wooden writing boards coated with a thin layer of plaster, which allowed them to erase their writing easily. They also used potsherds and flakes of limestone (ostraca) for practice or for writing brief memoranda and accounts. Although scribes strove to write a well-formed and legible hand, Egyptians do not seem to have cultivated an aesthetic appreciation of calligraphy, or "beautiful writing."

Egyptians exported papyrus to most literate societies of the ancient Mediterranean world, but few examples have survived outside the arid Egyptian climate. The oldest preserved papyrus from outside Egypt is a Hebrew scroll of about 750 B.C.E., found in a cave by the Dead Sea. Hebrew is one of the scripts that evolved from the Phoenician alphabet, which was developed in West Asia during the second millennium B.C.E. The alphabet, a system in which each sound in the language is represented by a sign, was revolutionary because it could be applied to any language, not just the Semitic languages for which it was invented. Early in the first millennium B.C.E. the Greeks adopted and modified the Semitic alphabet of the Phoenicians for writing their language. Not only did they reverse the direction of their writing so that it now read from left to right, but they also began representing all their language sounds, not only the consonants and long vowels, as the Semitic alphabets had done (and continue to do). This made for a crucial gain in legibility and accuracy in the transcription of sounds.

Classical authors suggest that Greeks were using papyrus rolls by the sixth century B.C.E., but the oldest archaeological evidence is some burnt fragments discovered in an Athenian tomb dated a century later. Because Greek was written from left to right, papyrus rolls were prepared for Greek writing by overlapping the left sheet over the right sheet to accommodate the direction of the script. The Greeks knew papyrus as khartes, but a papyrus roll was known in Greek as biblion (book) from the Greek word biblos, meaning "papyrus pith." The Greek word is the root from which such English words as bible and bibliography derive. The Romans later called the same form of book a volumen, a term seen now in such English words as volume and volume. Like Egyptian literary texts, Greek ones were often written on the roll in columns (known in Latin as pagina, from which our word page derives) perpendicular to the length of the roll. In contrast to literary texts, documents were normally written in an entirely different format, known as a rotulus, or roll. A rotulus had a single long column of text parallel to the length of the roll; it was unrolled and read vertically.

ness, impractical for making writing materials. The manufacture of papyrus thus was effectively an Egyptian monopoly. Indeed, the papyrus plant became the emblem of Lower Egypt and was regarded as so typically Egyptian that it could be a metaphor for the entire country.

Papyrus was used to make many things, including baskets, ropes, and boats, but from about 3000 B.C.E. its most important use was as a writing material. The earliest surviving example is a blank papyrus roll found in the tomb of Hemaka, an official of King Den of the First Dynasty (c. 2925–c. 2775 B.C.E.), at Saqqara. The quality of the manufacture is already so fine that Egyptians must have been making papyrus rolls for some time.

Although the first-century Roman writer Pliny the Elder described the manufacture of papyrus sheets in his Natural History, the description has given rise to varied interpretations. Examination of surviving papyri gives a better indication of how sheets of writing material were actually prepared. The papyrus stems were cut into manageable lengths, and the outer layer was removed from the pith, which was then sliced or peeled into very thin strips, normally 4/10–1/4 inches (1–3 centimeters) wide. The strips were arranged on a smooth surface in parallel lines, just touching or slightly overlapping each other,
These two distinct formats correspond closely to the types of scrolls used in East Asia: the horizontal handscroll and the vertical “hanging” scroll.

Rolls had several disadvantages, however. Only one side of the surface could be used for writing, and because there was a practical limit to the length of text that could reasonably be fitted on one roll, long texts had to be copied on several separate rolls, any one of which could easily become lost. Whereas reading a roll from beginning to end was easy, finding a particular passage meant scrolling through the whole.

When Alexander the Great liberated Egypt from Persian rule in 332 B.C.E. and appointed his general Ptolemy I Soter as its governor, Greek became the main administrative language of Egypt and the language used by Egyptians to write on their papyri. Ptolemy is famous for founding the great library in Alexandria, which was expanded by his son and successor, Ptolemy II. Thought to have contained more than half a million volumes, or papyrus scrolls, it was the intellectual center of the ancient world. Because Greek writers used a stiffer type of pen than Egyptian writers did, when it was used on unsupported papyrus, it was more liable to puncture the fragile writing surface; so Egyptian papyrus makers learned to manufacture thicker sheets to accommodate the Greeks.

W O O D E N T A B L E T S A N D P A R C H M E N T C O D I C E S

The horizontal roll was the most common form of book in antiquity, but other forms were also known. One was the writing tablet, which consisted of one to ten pieces of wood or ivory held together by a clasp or hinge or joined by a cord strung through holes drilled in the edges. A scribe could write directly on the tablets with ink or chalk, but in many cases the tablets were slightly hollowed out to hold a thin layer of wax into which writing could be impressed with the pointed end of a stylus (the other, rounded end was used to erase the wax surface by smoothing it). The edges and occasionally a small area in the center of the tablet were left raised to protect the text when the tablets were closed together (fig. 6). A pair of tablets that could be folded together to protect the waxed surface is known as a diptych. A multileaved tablet was known in Latin as a codex. Although the term was first used to describe a bound set of waxed tablets, it later came to refer to any collection of folded sheets of pliable material—whether parchment, papyrus, or, later, paper—joined along one edge.

Tablets were also known to the Hebrews, and the tablets of Moses, on which the God of Exodus wrote the Ten Commandments, have traditionally been imagined as a diptych. The Greeks, who may have learned about tablets from the Hittites of Asia Minor, used them before they acquired papyrus from the Egyptians. The oldest extant set of tablets was long believed to be an ivory set in the British Museum found at the Assyrian site of Nimrud, in northern Iraq.
Fig. 6. Wooden writing tablet discovered at Vindolanda, a Roman frontier post in the north of England, late 1st or early 2d century C.E. British Museum, London

Fig. 7. Pair of boxwood writing tablets hinged with ivory, discovered in the Uluburun shipwreck off Turkey, 14th century B.C.E. 3 1/2 x 5 in. (8.9 x 12.5 cm). Courtesy of the Institute of Nautical Archaeology, Texas A & M University [IFW 4370]

and dated to about 707 B.C.E. Recently, however, archaeologists exploring a shipwreck off the coast of Turkey from the late fourteenth century B.C.E. found a pair of small (2 by 3 inch; 50 by 80 millimeter) hollowed tablets of wood held together by an ivory hinge (fig. 7). Writing tablets therefore were used centuries earlier.

Although the ancient Greeks used both writing tablets and papyrus rolls, the tablets were mainly for recording more transitory or mundane information, such as letters, memoranda, bills, accounts, exercises, and drafts of texts. Whether of wood, ivory, or baked clay, tablets were inherently unsuitable for recording lengthy texts, particularly literature, because a work of even moderate length would require many tablets, which would then need to be kept and read together. The Mesopotamians had maintained archives—for example, at the palace of Assurbanipal in Nineveh, where as many as twenty-six thousand clay tablets were stored in baskets, bags, and jars and on shelves—but storage and reference were always a problem with tablets, and outside Mesopotamia they were rarely collected in libraries. Writing tablets are documented from the earliest period in Rome, where they served to record legal documents and official certificates, and the wax tablet remained a common writing surface through much of the Middle Ages for initial composition, correspondence, notes, or business correspondence. Around the year 600, Pope Gregory the Great, for example, preached a series of sermons on the Book of Job that a scribe took down in shorthand on wax tablets; the text was then transferred to thirty-five papyrus rolls, and the wax tablets were smoothed down for reuse.

Rolls were also prepared from parchment—a light-colored, stiff, and relatively inelastic material made from animal skins that have been scraped, soaked, and dried. Its Latin name, pergamenta, from which our word parchment

the outer surface. This arrangement minimized strain and fraying, for when rolled, the inner fibers would be compressed and the vertical fibers on the exterior stretched apart. It also helped scribes to write straight, for they could use the lines of the fibers as guides. Scribes preferred to write on the inside surface of a roll because the exterior could be smudged easily. When read, the roll was held in the left hand and unrolled into the right, as we can see from images of seated and standing scribes. If only a small surface of the roll was exposed, the papyrus was sufficiently stiff to allow the scribe to write without resting it on a hard surface.

Seated scribe, 5th Dynasty (c. 2565—c. 2225 B.C.E.). Musée du Louvre, Paris [E 3025]

The surface of the prepared roll was quite smooth despite the visually prominent lines of papyrus fibers, and the lines do not appear to have bothered... continued
The dried plant sap was a natural size; it prevented ink from penetrating the surface, so the scribe could erase by wiping or washing away the wet ink or using a stone scraper to abrade the dried surface. The scribe's kit consisted of a pen case, with slots for reed or rush pens; cakes of pigment (red, black); and a pot to hold water. The rush pen was cut obliquely and often chewed to achieve a stiff but brushlike point.

Egyptian scribes. The dried plant sap was a natural size; it prevented ink from penetrating the surface, so the scribe could erase by wiping or washing away the wet ink or using a stone scraper to abrade the dried surface. The scribe’s kit consisted of a pen case, with slots for reed or rush pens; cakes of pigment (red, black); and a pot to hold water. The rush pen was cut obliquely and often chewed to achieve a stiff but brushlike point.

Derives, comes from the city of Pergamon, in western Anatolia. The Roman author Pliny claimed that parchment had been invented when the Pergamene ruler Eumenes II Soter had to invent a new writing material in the second century B.C.E. because the Ptolemies, jealous of Pergamon’s growing library, had embargoed shipments of papyrus from Egypt. Other classical sources, however, indicate that parchment and leather had long been the principal writing materials in the lands east of the Mediterranean. Since antiquity the Jews have copied the Torah on one side of parchments made from the skins of ritually permitted and slaughtered (kosher) animals. The prepared sheets are sewn together with sinews from similar animals to form a long roll on which the text is copied in black ink. The roll itself may not be touched, but it is manipulated by two wooden rollers, and the reader’s place is kept with a pointer known as a yad, or “hand” (fig. 8). Corroboration for the use of parchment in the eastern Mediterranean region is provided by the Dead Sea Scrolls (second century B.C.E.—first century C.E.), some of which were written on this material.

At first, the Romans regarded parchment as inferior to papyrus, a writing material sanctioned by some three thousand years of use, and they deemed it suitable only for use in notebooks, not rolls. Although parchment was more expensive than papyrus—primarily because the animal had to be killed to make it—it could be made anywhere animals were available—everywhere, in effect. Nor did parchment fray or split when folded, a distinct advantage as the codex form of book, previously used only for tablets, became more popular.

**Fig. 8.** Parchment Torah scroll with wooden rollers projecting from the ends. The reader keeps his place in the text with a yad, or pointer.
The increasing popularity of the codex in late antiquity is usually associated with the adoption of parchment, but the two developments were probably independent. The codex offered several improvements over the roll. In addition to the reduced production costs (because a writer could use both sides of the material, not just one) and the ability to accommodate even the lengthiest texts, codices are easier to handle, use, and store. To refer to a passage in the middle of a codex, one needed only to flip it open at that point.

The Romans began using parchment codices by the first century C.E. The Spanish-Roman poet Martial, though not using the word codex, referred to pocket editions of his poems on parchment, which were undoubtedly in codex format. The first extant fragment of a codex, an anonymous Latin work, dates from 100 C.E. and is actually on papyrus (fig. 9). Nevertheless, it was not until the third century that codices were accorded the official status of liber, or book, a position previously reserved only for the papyrus roll. Codices are scarcely mentioned in Greek literature before the third century, but by the fourth century they seem to have gained parity with papyrus rolls.

Scholars have been tempted to associate the ultimate success of the parchment codex over the papyrus roll with the contemporary growth of Christianity, particularly because virtually all early Christian texts survive as codices. The Nag Hammadi library, for example, is a cache of Greek texts discovered in Egypt in 1945. They had been translated into Coptic and transcribed as codices in the fourth century. Scholars have hypothesized that because most early Christians belonged to the lower classes, they would have preferred humble notebooks to noble rolls. Elaborating this thesis, the British scholar C. H. Roberts ingeniously argued that Mark originally write his Gospel in Rome in a
The Parchment-Maker.

Ich samt Sacke und Bock
Die hallig ist trum in der eck
Darnach firm ich die sauber ret
Spam auf die Zarf ich leltete
Schade damals ich Perigri dazu
Mit groszer arbeit in mein Haus
Zua-eigen und kinnen ich Bild und Lein
Zu eite verstauff ich beim.

Fig. 10. Page from a blank papyrus codex later inscribed with a Greek grammar, a Greek–Latin lexicon, and a Latin calligraphic alphabet, c. 400 C.E. Reproduced by kind permission of the Trustees of the Chester Beatty Library, Dublin (GBL Pap. Ac.1499)

“Der Permenter.” by Jost Amman.
From Hans Sachs, Eggeschliche Beschreibung aller Stände auff Erden (1568)

...continued

parchment notebook; later, Egyptian Christians would have recopied it as a papyrus codex, thereby creating a vogue for codices among Christians.

Roberts changed his mind, however, suggesting (with T. C. Skeat) that the origins of the codex lay instead in the Jewish habit of recording oral law in bound tablets or leaves, as opposed to their tradition of copying the written law (the Torah) on rolls. According to this hypothesis, eastern Christians would have recorded Jesus’ deeds and sayings (the Gospels) following the Jewish tradition for writing oral law. Scholars have raised objections to this theory, too.

More recently, James O’Donnell has argued that Christianity was “the high-tech religion of late antiquity, using the written word resourcefully to create and shape itself.” In this context, small, easily concealed books would have been an appropriate technology for a mobile, persecuted religion, and the codex page lent itself to admirably new, nonlinear methods of reading and reference.

Whatever the truth of the matter, books from early Christian times are exceedingly rare, and most of the surviving fragments have been found in Egypt, which was just one of the many provinces of the Roman empire. The exceptional climate of Egypt may explain the unusual rate of survival there, but that reason is external to this discussion. Egyptian evidence does not necessarily represent or explain what happened everywhere else.

By the middle of the fourth century the codex had become the accepted form of the book throughout the Christian empire: the emperor Constantius
II instructed the scribes of the library at Pergamon to transcribe texts preserved on papyrus rolls onto parchment codices. Between the second and fourth centuries, Egyptians made their codices mostly from papyrus, even though the codex format exposed two of the weaknesses of papyrus: it is damaged by creasing, and it frays easily at unprotected edges. Papyrus codices were made up as blank books for later use, to judge from an example in the Chester Beatty Library dated to about 400 C.E. and inscribed later with a Greek grammar, a Greek-Latin lexicon, and a Latin calligraphic alphabet (fig. 10).

Elsewhere codices were made from parchment sheets. Among the earliest surviving manuscripts of the Christian Bible are the Codex Sinaiticus, perhaps copied at Caesarea, in Palestine, during the late fourth century, and the Codex Alexandrinus, copied at Alexandria in the late fourth or early fifth century. The Codex Sinaiticus, which included the complete New Testament and part of the Old Testament, would have contained nearly eight hundred leaves measuring 15 by 13 inches (370 by 320 millimeters), with four columns of forty-eight lines per page. Assuming that each sheet of parchment could have produced between two and four leaves, several hundred animals must have been slaughtered for the writing surface. The scribe’s use of multiple narrow columns is a holdover from the earlier practice of writing paginae (columns) on papyrus rolls (fig. 11).

Papyrus retained its importance even after the Arabs conquered Egypt in the seventh century C.E., although they adopted the Jewish and Christian practice of using parchment for copying scripture; the Koran, God’s revelations to the Prophet Muhammad, was always transcribed as a parchment codex. The Arabs called papyrus qirtas, a word derived from the Greek khartes, and they continued to export it not only to Byzantium and Rome but also to other parts of the empire, where it was used, along with parchment, for keeping tax and payment records. Arabic papyri dated as late as the mid-ninth century have been discovered in Syria and Israel. Some papyrus was grown along the Euphrates in Mesopotamia, for Caliph al-Mutasim is said to have established a papyrus mill staffed by Egyptians at his capital, Samarra, in 836, but production there was insignificant. The tenth-century Sicilian geographer Ibn Hawqal indicates that papyrus was grown in Sicily, but most of it was used to make cordage for ships, and the small amount of writing material produced was reserved exclusively for the chancellery.

Papyrus remained the principal writing material in Egypt until the mid-tenth century. The vast majority of Arabic papyri to survive are fragments of rolls containing official and commercial documents, such as tax registers, accounts, orders, notarial deeds, deeds of purchase and lease, legal acknowledgments, marriage contracts, and private letters, but some literary papyri survive as well (fig. 12). As had been the practice since antiquity, nearly all Ara-
FIG. 11. Pages from the Codex Sinaiticus written in Greek on large sheets of parchment, late 4th century C.E. Each page measures 15 1/4 x 13 1/4 in. (38.8 x 34.4 cm). British Library, London

FIG. 12. Papyrus sheet inscribed with a financial reckoning on one side and an autobiographical account on the other. Egypt, 9th century C.E. The Nasser D. Khalili Collection of Islamic Art, London [PPS 411]
bic documents were written in long columns on one side of the papyrus roll; the rolls were held vertically to read. Literary texts, on the other hand, were normally written as codices, following the Late Antique tradition of using the codex form for transcribing literary works. At least two examples are known to survive: the stories of the prophets in the style of Wahb ibn Munabbih, dated 844, and a collection of Prophetic traditions by the Maliki traditionist Abdallah ibn Wahb, copied at Isna, in Egypt, in 889.

The historian al-Masudi wrote in 956 that papyrus manufacture was not completely defunct in Egypt, but Ibn Hawqal, who visited Egypt a few years later, in 969, made no reference to the use of papyrus as a writing material, although he did mention the papyrus plant. Egyptians still used papyrus in preparing amulets and for medical treatment, but by the late tenth century it had been decisively replaced by paper, the writing material invented a thousand years earlier in China. The papyrus industry, which had survived in Egypt for four thousand years, ground to a halt, and whatever papyrus was around was used by bookbinders to make pasteboard for book covers.

The decline and death of the ancient papyrus industry is not discussed by medieval Arab authors. Egyptian manufacturers of papyrus sheets must have known for several centuries—ever since writers began to prefer codices and parchment—that their long monopoly over writing materials in the Mediterranean region was at an end. Although parchment had the great advantage over papyrus that it could be made virtually everywhere, paper had the even greater advantage that it could be made everywhere cheaply and in industrial quantities. Although Byzantine administrators were undoubtedly happy to keep ordering supplies of papyrus from Egypt, and Egyptian papyrus makers were undoubtedly happy to keep supplying them, the growing use of paper by a burgeoning bureaucracy in Iraq surely decreased demand for Egyptian papyrus by the beginning of the ninth century. The papyrus beds were abandoned or turned over to other cash crops, such as sugar cane or flax, and the native plant eventually died out in Egypt. Eventually paper came to be manufactured in Egypt itself.

**BAMBOO STRIPS AND SILK CLOTH**

The earliest writing to survive from China dates from the end of the second millennium B.C.E. The Chinese system of writing is generally believed to have been invented independently of early Mesopotamian writing, although the spread of sheep raising from Mesopotamia across Central Asia may have provided a means by which the concept of writing was brought to China: with the sheep came people and ideas. According to Chinese tradition, preserved in the *Judgments* appended to the *I Ching* (Book of Changes) prior to the invention of writing, “government was achieved with the help of knotted cords,” presum-
ably a reference to a mnemonic device similar to the quipu used by the Incas of pre-Hispanic Peru. As in Egypt, the development of writing in China was unconnected to the medium on which writing was done. Unlike Sumerian and Egyptian, which used both pictographs and syllable signs, or Hebrew, Greek, Latin, and Arabic, which used alphabets, ancient Chinese writing expressed words only in pictographs, one character corresponding to one word.

The earliest Chinese writings to survive are tens of thousands of questions to oracles incised on the shoulder blades of animals (largely oxen) and tortoise shells during the Shang dynasty (c. 1600—c. 1050 B.C.E.). These inscribed objects were subjected to heat; the resulting cracks in the bones or shells were read and interpreted. Other inscriptions, with the names of ancestors and supplications for protection, long life, and blessings, have been found on bronze vessels, as well as on stone and jade artifacts. By placing these inscriptions on durable materials that would not rot, the Chinese hoped to assure that their descendants would receive blessings.

Before being incised, the pictograms on the oracle bone inscriptions could have been painted with a brush, and brushed characters have been found on potsherds discovered at Shang archaeological sites. These remnants hint at a parallel—if now lost—Chinese tradition of writing with a brush and ink on flat surfaces. The earliest reliable literary evidence for such writing dates from the

![Image: Bamboo tablets inscribed in ink with part of the Book of Rituals, discovered in Wuwei, Gansu Province, 25–220 C.E. 21 x ½ in. (54 x 1 cm). From Wu-wei Han chien (1964), fig. 1058]
late sixth or early fifth century B.C.E., when books were normally written with ink on narrow strips of bamboo or wood or on lengths of silk. The best and most complete extant examples, however, date from the first three centuries C.E.

Some forty thousand ancient bamboo and wooden strips have been discovered since the nineteenth century. Long and very narrow (20 by ½-1 inch; 50 by 1-2 centimeters), these strips, often called tablets, owe their shape to the bamboo from which they were normally made. They were bound together in books by means of interlaced cords strung through holes pierced in the tablets; the books look somewhat like bamboo blinds (fig. 13). Each tablet was inscribed vertically with about thirty characters, although some tablets contain as many as eighty. The medium determined the form of the message, for the use of such narrow material probably led to the distinctive organization of Chinese script in vertical columns that has continued to the present day.

Woven cloth of silk, which had been made since the late fourth millennium B.C.E., provided a much more generous surface for writing, but silk was far more expensive than bamboo or wooden strips because it was so laborious to produce: the silkworm cocoons had to be boiled, their filaments had to be unraveled and gathered together into threads, and the threads had to be woven into cloth. Silk cloth, therefore, was used only where bamboo or wood did not suit a particular purpose: for final editions of books that required a more gen-

![Fig. 14. Silk map discovered in Mawangdui, 2d century B.C.E. 28 pieces; the whole originally measured 39 x 31 in. (98 x 78 cm)](image_url)
The invention of paper

The invention of paper in the late first century B.C.E. was commemorated in the story of Cai Lun, or Marquis Cai, a eunuch who served at the imperial court during the reign of the emperor Hedi. According to a story in circulation some 350 years later, Cai Lun made zhi from the bark of trees, remnants of hemp, rags of cloth, and old fishing nets and used it for writing. The emperor praised him for his invention, and it was called the "zhi of Cai Lun." Archaeological and literary evidence suggests that paper had already been known for several centuries and that the story of Cai Lun is a pleasant fiction made up long after the events in question to add color to a long and obscure process.

Zhi was defined in a Chinese dictionary compiled around the time when Cai Lun lived as "a mat of refuse fibers" (xu yi zhan ye). The word xu refers to fibrous remnants obtained from rags or from boiling silkworm cocoons, and the word zhan refers to a mat made from interwoven rushes used for covering something. Since such processes as the treatment of refuse silk, the reuse of old fibers in quilted clothes, and the washing of hemp and linen rags are attested in China as early as the sixth or fifth century B.C.E., it is possible that someone accidentally placed wet refuse fibers on a mat and dried them. This might have then suggested the idea of forming them into a thin sheet, although the earliest surviving papers were made not from refuse silk but from hemp fibers. As silk fibers have neither the physical nor chemical properties of the cellulose fibers that are essential to papermaking, true paper could not have been made from silk refuse, even though the Chinese character for zhi (paper) bears the silk radical at its left.

Over the past century, archaeologists have discovered very early specimens of paper at several arid sites in western China. The technical analysis and dates proposed for these specimens have engendered a vigorous controversy, although none would deny Chinese preeminence, and most agree that paper had been invented by the second century B.C.E.—a full two, if not three, cen-
turies before Cai Lun. Perhaps the oldest fragment yet discovered is the coarse hemp paper found at Ejin Banner in Inner Mongolia. Dated to the Western Han period (206 B.C.E.—9 C.E.), it is too coarse to be suitable for writing. Specimens discovered in Baqiao (Ba Bridge), in the Chinese province of Shaanxi, in 1957, including one piece about 4 inches (10 centimeters) square, were made from hemp (Cannabis sativa) and dated no later than the reign of the Western Han ruler Wudi (141–87 B.C.E.). Said to be light yellow, thick and uneven, coarse and crude, the pieces show the impressions of weaving on the surface, undoubtedly from the woven cloth mold in which they were made. One of the specimens revealed some microscopic loops of fiber, and another contained a small remnant of thin, two-ply hemp cord, suggesting that they had been made from reused fibers. Another fragment, measuring 4 by 1½ inches (10 by 4 centimeters), was found in the ruins of a watchtower at Lopnor, in Xinjiang, by members of the Mission of the Northwestern Expedition of China in 1934 and dated on circumstantial evidence to about 49 B.C.E. A few other fragments of paper, most attached to a lacquer utensil found alongside some coins of the time of the Han emperor Xuandi, who reigned in the first century B.C.E., were discovered in an underground vault unearthed in Zhongyan, Shaanxi Province, in 1978. None of these was suitable for writing, and it is unlikely that any of them were made in the remote regions where they were discovered. Rather, the origins of papermaking must lie in the more temperate, indeed tropical, regions of southern and southeastern China.

Literary evidence confirms the utilitarian role to which paper was put in early times. A Chinese story set in 93 B.C.E. records the first use of facial tissue—an imperial guard advised a prince to cover his nose with a piece of zhi—and another story mentions poisonous medicine wrapped in he-ti—the word is glossed by a second-century C.E. commentator as a thin piece of red zhi. By the first century C.E., however, well before Cai Lun supposedly invented the material, paper was already used for writing, indicating that papermakers had discovered how to surmount one of its few disadvantages: unless the surface is treated in some way, it absorbs ink like a blotter. Specimens from the third century indicate that papermakers had a range of sizing techniques, from coating the surface with gypsum to treating it with gum, glue, or starch, to prevent the ink from spreading. Already in the official history covering the reign of emperor Guangwu in the early first century C.E., the Assistant of the Right was responsible for supplying paper, brush, and ink. By 76 C.E. a scholar was able to instruct students by using copies of the classics written on (wooden or bamboo) tablets as well as zhi, so paper must have become reasonably common.

These reports have also been confirmed by archaeological finds in western China. In 1942, for example, investigators from the Academia Sinica found a
specimen of coarse, thick paper inscribed with about two dozen readable characters under the ruins of an ancient watchtower near Juyan (formerly Karakhoto), in Inner Mongolia. Because this watchtower was abandoned by its Chinese defenders between 109 and 110 C.E., the specimen has been dated on historical grounds to the early second century (and it might be earlier) and has been considered the earliest sample of paper with writing on it. In 1974, two larger pieces of paper dated to 52 B.C.E. were found in another watchtower in Juyan, along with twenty thousand inscribed wooden tablets. In the same year several inscribed specimens were found in a pre-220 C.E. Han tomb discovered at Hantanpo, near Wuwei, in Gansu Province (fig. 15). Made of hemp, the specimens are said to be more technically advanced than other examples, being white and much thinner, and perfectly suited to writing with brush and ink. In 1991, paper dating from the time of the Han emperor Xuandi, in the first century B.C.E., was discovered between Anxi and Dunhuang, in Gansu Province. Two well-preserved sheets of flexible yet strong white paper of a uniform thickness were unearthed at the Eastern Han tombs on Fulong Plain near Lanzhou, also in Gansu Province.

From these early examples, we can tell that the first papermakers formed sheets by pouring a pulp made of rags and textile waste onto cloth molds floating in a pool of water, but as they became more proficient and the use of paper expanded, they developed different techniques and new sources of fiber. In particular, they began to use a new type of mold, which was made in two pieces and could be dipped in a vat of pulp. Because the damp sheet of paper could be removed from the screen once it was formed, this sped up the process considerably, for the same mold could be used immediately to make another sheet.

Chinese papermakers also began to abandon waste materials as the source of paper and to make their pulp from the bast fibers of such plants as hemp, jute (Corchorus capsularis), rattan (Calamus spp.), and bamboo or from the inner bark of paper mulberry (Broussonetia papyrifera) or mulberry (Morus alba). They used the fibers and barks either alone or in combination, and the choice and relative amounts seem to have varied from region to region, depending on what was locally available. Paper made from mulberry was used for public
records, unearthed at Lopnor, during the Wei (220–65) and Western Jin (265–317) dynasties. Paper made from rattan was used during the Western Jin, and by the time of the Southern and Northern dynasties (317–581) rattan paper produced in Shanxi, in Zhejiang Province, was known as Shan paper.

Because molds had to be of manageable size, sheets of paper were, like Egyptian papyrus and Chinese silk, typically pasted into rolls for writing. Individual sheets averaged about 1 foot wide by 2 feet long (30 by 60 centimeters), so the mold must have been conveniently small to handle. The size of the mold gradually increased from the sixth century to the tenth, but the typical long scroll was still pasted up from ten to as many as twenty-eight sheets of paper. The beginning of the scroll was usually covered with a thicker sheet, much like the protocollon of Egyptian papyri, which protected and provided information about the contents; the other end was attached to a wooden roller. (This format is quite distinct: the papyrus roll of the Mediterranean world had no rollers, and a Torah roll has two.)

Under the Tang dynasty (618–907), paper manufacture became so specialized that papers were manufactured for particular purposes, and some of the special characteristics of paper were exploited. Paper made from the bark of paper mulberry, for example, which grows in mountainous areas of northern and southern China, was snowy white when the shrub had been nurtured in rich soil and the paper prepared with pure water. Pure Heart Hall paper, praised as the best paper of the time, was made that way and prepared in scrolls more than 50 feet (17 meters) long. Excavations at the Temple of Auspicious Brightness (Ruiguang si) in Suzhou uncovered specimens of magnificent green writing paper dated to the tenth century and possibly made from mulberry bark; the paper was smoothed with wax to give it the glossy finish popular with calligraphers. White rattan paper was used for official Inner Chamber edicts from the Tang government; bluish-green rattan paper, for literary documents. Bamboo paper was first made during the Tang period, and the calligrapher and landscape painter Mi Fu used it effectively in his impressionistic ink washes in creating soft and misty effects. Paper made from jute was first used in 715 for an imperial edict of the emperor Xuanzong; imperial edicts thus became known as "jutes." Sandalwood (Santalum album) was also used for the manufacture of paper. Paper made of a mixture of two types of bark—paper mulberry and bamboo, bamboo and hemp, or hemp and paper mulberry—was popular. Paper made from grass, abundant everywhere, was used by the common people.

The Chinese soon discovered that paper was suitable for purposes other than wrapping, writing, and painting. They used it for ceremonial offerings, household articles, clothing, hats, and kites—which the Chinese firmly believe were invented in China. General Han Xin (d. 196 B.C.E.) is said to have had a
paper kite flown over a palace under seige so that he could gauge the length of tunnel his troops would need to dig under the palace defenses for a surprise attack, but the early date of this story may reflect wishful thinking. By the early seventh century paper kites were certainly employed for military signaling and for weather forecasting, and the nobility began to use them for amusement, often in a form incorporating a lantern.

Toilet paper was used by the sixth century, or so we can gather from a report about the noted scholar Yan Zhidui. Two years before his death he instructed his family not to use for toilet purposes paper on which quotations of commentaries from the Five Classics or the names of sages had been written. This suggests that at least some types of paper were cheap enough to use in such a way. Yan Zhidui's report is confirmed by that of a ninth-century Arab traveler to China. The traveler, who was used to Islamic traditions of personal hygiene, commented disapprovingly that the Chinese "are not careful about cleanliness, and they do not wash themselves with water when they have done their necessities but only wipe themselves with paper."

Perhaps the most important new use of paper in China was for printing, the reproduction with ink of reverse or negative images. Carved bronze and stone seals, from which impressions were made on clay and silk, had been used in China for millennia, and the process of taking inked rubbings from stone and bronze reliefs may have been another impetus to develop printing by the seventh century. The oldest example of Chinese woodblock printing is believed to be a miniature charm scroll, made of thick mulberry paper, about 20 feet long and 2 ¼ inches wide (6 meters by 60 centimeters), impressed with twelve woodblock prints (fig. 16). Containing the text of a Buddhist sutra in Chinese, the scroll was discovered in a pagoda at Pulguk Temple near Kyongju, Korea, in 1966. Several peculiarities suggest that the original Sanskrit text had been translated into Chinese by 704, and, because the style of calligraphy is similar to that found in Chinese manuscripts of the period, it is believed that this specimen was printed in Tang China in the early eighth century and brought to Korea no later than 751, when it was placed in the pagoda.

The oldest printed book in the world is a printed paper copy of a Chinese translation of the Diamond Sutra dated to 868 and found at Dunhuang, a major Buddhist site on the Silk Road (fig. 17). Seven sheets of white paper, each measuring 10 ½ by 30 inches (26.6 by 76.2 centimeters), were pasted together to form a scroll 17 ¼ feet (5.33 meters) long. The scroll has a woodcut frontispiece and a colophon stating that "Wang Jie recently made this for universal distribution to gain blessings to his parents on the thirteenth of the fourth moon of the ninth year of Xiantong." Other books from the later Tang period were prepared on a regularly folded roll, a format often known as
Fig. 16. Detail of early 8th-century miniature printed charm scroll discovered in a pagoda in Pyongju, Korea, in 1966. This section shows how the scroll was pasted up from several sheets of paper. Height 2 1/4 in. (5.7 cm).
Cultural Properties Administration of the Korean Government

Fig. 17. Block-printed frontispiece and beginning of the text from the Diamond Sutra, discovered in the Cave of the Thousand Buddhas in Dunhuang, 868 C.E. British Library, London
"accordion" style. The form, though using only one side of the paper, allowed for convenient consultation of long texts and has remained in use in East Asia to the present day.

The Chinese may have invented movable type as early as the mid-eleventh century, but they did not use it widely, and woodblock printing remained the principal vehicle of traditional Chinese printing. This was probably because movable type did not save much labor when printing Chinese. Written Chinese is composed of thousands of ideograms, and since several copies, or sorts, would be needed for each character (twenty or more for the commoner ones), a font of some 200,000 sorts would not be unusual. The labor of making so many individual characters was not significantly less than carving entire woodblocks, and woodblock printing remained popular for centuries. Once printing became more widespread in the Song period (960–1279), the need for more paper on which to print more books stimulated the development of the paper industry, and the history of printing and paper was forever after intertwined in China as in Europe, but not, as we shall see, in the Islamic world.

THE DIFFUSION OF PAPER

China played the primary role in the diffusion of Buddhist scholarship throughout Asia in the first millennium of the Common Era, and Buddhism was the means by which paper, too, was spread throughout Asia. All students of Buddhism would have learned the Chinese crafts of making brushes, ink, and paper to spread Buddhist teachings more efficiently. Paper and papermaking skills were thereby exported from China to other lands, perhaps beginning as early as the third century. The closer a country lay to the centers of Chinese Buddhism, the sooner paper was used and made there. Because the main center of Buddhism remained in India, Chinese Buddhists traveled between the two countries, taking the Silk Road across western China. The extremely dry climate of the west allowed the preservation of specimens that would have been lost elsewhere, and indeed, this is where most early specimens of Chinese paper have been found—including the largest and most spectacular collection of medieval Chinese paper, consisting of more than thirty thousand paper rolls, found at Dunhuang. The greater part of the texts are written in Chinese, but some are written in Sanskrit, Soghdian, Middle Persian, Uighur, and Tibetan, showing the strong interregional connections in this now-remote corner of the globe.

Most of the papers found at Dunhuang were made from hemp and paper mulberry fibers, with a few made from ramie and mulberry fiber. Although Chinese literary sources indicate that bamboo and rattan were also used at this time, these materials were not found among the Dunhuang papers, perhaps
because bamboo and rattan did not grow in the colder and drier climate of eastern Central Asia, although it is unlikely that all the Dunhuang papers were made locally. Papers from earlier periods at Dunhuang, especially those made in the seventh and eighth centuries, are generally thin, of even thickness, highly finished, well sized, and stained yellow or brown. Those of the tenth century are of poorer quality, being mostly coarse, drab-colored, and thicker than early Tang papers. This change reflects more on Dunhuang’s declining fortunes than on any deterioration in Chinese papermaking technology, which continued to improve.

In the early twentieth century the explorers Sven Hedin and Sir Marc Aurel Stein found paper fragments datable to the third century in the Loulan region of western China, and Prussian and Japanese expeditions found paper dating back to the fourth and fifth centuries in the Turpan and Gaochang area. In Hotan (Khotan), Stein also found paper manuscripts in Chinese, Tibetan, Sanskrit, and ancient Khotanese datable to the eighth century. Although some of these papers must have been brought from elsewhere in China, some may have been manufactured locally. Among the documents found at Turpan in 1972, one dated 620 bears the name of a zhishi, or papermaker, and another mentions sending prisoners to work in paper factories at an unspecified location. The preparation of the fiber for papermaking, particularly the laborious beating and hydrating of the stuff in mortars, must have been arduous, low-status work. It is no surprise that prisoners were compelled to do it.

The ancient letters in a mailbag discovered by Stein in a ruined watchtower between Dunhuang and Loulan (fig. 18) were written in Sogdian, probably no earlier than the fourth century, and perhaps as late as the sixth, although
Stein initially dated them to the second century. Whatever their date, however, they indicate that in addition to Buddhist monks, Silk Road merchants throughout the oasis cities of Central Asia used paper well before the coming of Islam to the region in the early eighth century. Chinese merchants—and paper—made it much farther west, for several pieces of paper inscribed in Chinese with notations of purchases were discovered at the eighth-century site of Moshcheyva Balka, in the Caucasus Mountains of southern Russia.

On the other side of China, the Chinese probably introduced paper to Korea by the third century, but no specimens that early have been found there. The northern part of Korea was under Chinese control from 108 B.C.E. to 210 C.E., toward the end of the Han period, and Chinese Buddhists probably brought paper inscribed with Buddhist texts to Korea during these years. It is not known exactly when the Koreans began manufacturing paper themselves, but, as elsewhere, it is likely that Buddhist monks and students who had studied in China brought papermaking to Korea.

The earliest Korean papers to survive include a glossy white paper made of hemp fibers discovered at a North Korean site dating to the Koguryo era (37–668 C.E.). They show that Korean papermakers followed Chinese precedents, using the same raw materials, tools, and techniques. Korean paper, known as jilin ji (paper from the Silla Kingdom), was an item of tribute to China and received high praise from Chinese literati and artists for its qualities. Thick, strong, whitish, and glossy, it was especially prized for calligraphy and painting.

Koreans in turn introduced paper and papermaking to Japan. Already in the second half of the fourth century a Korean scholar, Wani, who served as tutor to the crown prince of Japan, presented several Chinese books, presumably copied on paper, to the Japanese court. During the sixth century Korean kings sent books, also presumably on paper, to the Japanese on several occasions, and in 610 the Korean monk Danjing went to Japan, where he was known as Doncho. Like all Buddhist monks educated in China, Doncho would have been trained to make brushes, paper, and ink. His arrival has been traditionally understood to mark the beginning of papermaking in Japan, but Korean immigrants may already have introduced papermaking to Japan in the fifth century. In time Japanese paper developed its own characteristics and came to rival the paper of China.

Papermaking was probably introduced in Vietnam, which had close political and cultural ties with China, as early as the third century, about the same time that it was introduced in Korea. In 284, thirty thousand rolls of "honey fragrance paper" (mi xiang zi) were brought to China from "Da Qin," presumably Vietnam, and this paper, made from garco wood (Aquilaria agallocha), is said to have been shipped by Alexandrian merchants. Sometime between 265 and
290 the district of Nan-Yue, located in present-day southern China and northern Vietnam, sent China a tribute of more than ten thousand rolls of "intricate filament paper" (ce li zhi), perhaps made of fern or seaweed.

Oddly, although Chinese Buddhist monks traveled along the Silk Road to India in the first centuries of the Common Era, there is no evidence that Indians made paper until Muslims introduced the craft to the subcontinent perhaps a thousand years later. Writing had been used in India since the second half of the third millennium B.C.E.; various materials, including leaves, wooden boards, bamboo chips, and metals, were inscribed. The leaves of the talipot palm, native to south India, came to be preferred for books, but any kind of broad leaf was probably acceptable, and until recently, leaves of the plantain and sala trees were used in village schools (fig. 19).

The poor initial reception of paper in India is an enigma. For writing was used there, and the raw materials from which paper was made in East Asia were readily available. The hot and moist climate in much of India is, however, unsuitable for the long-term preservation of paper documents, as are the many insects that find cellulose a good meal—hence the invocation "O King of the Cockroaches!" in some medieval Arabic manuscripts. Made to keep the ruler's "subjects" from eating the book. Some scholars have blamed the tradition-bound caste system for discouraging the adoption and development of new techniques, such as papermaking. Possibly, high-caste Indians, precisely those people most likely to be literate, thought that they could be polluted from contact with paper made from recycled rags.

The earliest recorded use of paper in India dates to the eleventh century, when Jewish merchants—and presumably Muslim merchants as well—exported it from Egypt and Arabia to their colleagues in Gujerat. Even today, papermaking
by hand is largely associated with Muslims. The first papermills are attested only in the fifteenth century, when a sultan of Kashmir, returning from Samarkand, brought along artisans to establish a papermaking industry there.

THE INTRODUCTION OF PAPER IN THE ISLAMIC LANDS

The story that paper was introduced to the Islamic lands when Muslim soldiers captured Chinese papermakers at the battle of Talas in 751 is just that—a story—but the details illuminate some historical facts pertinent to the diffusion of paper. The army of the Arab commander in Central Asia, Ziyad ibn Salih, routed the Chinese army of Gao Xianzhi, and, according to the story, returned to their base at Samarkand with one, two, or several captive Chinese papermakers. There the captives would have used local supplies of hemp and flax, as well as the abundant water from irrigation canals fed by the Zarafshan River, to start a paper industry, for which the city remained famous for centuries.

The city of Talas, in southern Kazakhstan, formerly known as Awliya Ata and Dzhambul, sits on the Talas River where it is crossed by the Silk Road. In the seventh century, after the collapse of the Western Turkish and Sasanian empires, the Chinese had taken advantage of the power vacuum in the region and expanded their authority over Transoxiana, whose rulers had long dispatched embassies to China and received titular honors from the Chinese. In 659, Chinese forces reached Samarkand and Bukhara.

Meanwhile, Muslim rulers had also turned their attention to Transoxiana. After the death of the prophet Muhammad in 632 and the rule of the first four caliphs from Arabia, the governor of Syria seized power and established his family as the Umayyad caliphs, with their capital at Damascus. In the following decades, Umayyad military successes in the east, particularly the conquest of Iran and Transoxiana, led Muslims to look increasingly away from the Mediterranean lands and toward Iran and Central Asia. This shift intensified, particularly as dissatisfaction with Umayyad rule grew under the direction of the Abbasids—descendants of the Prophet’s uncle Abbas—until they led an army from the northeastern Iranian province of Khurasan against the Umayyads. The Abbasid revolution in 749–50 resulted not only in the fall of the Umayyads and the further displacement of the Islamic capital from Syria to Iraq but also in a new eastward outlook, as the once peripheral provinces of Khurasan and Transoxiana became central to Abbasid politics and culture.

Like the story about Cai Lun, the story about captured papermakers is probably false for several reasons. As I mentioned in the Introduction, it is first reported three centuries after the events in question by the Arab historian Thaalibi, in his Book of Curious and Entertaining Information. Among Thaalibi’s chap-
ters is one enumerating the specialities of different lands. One of the special-
ities of Samarqand, he wrote, is paper, which looks better, is more supple, is
more easily handled, and is more convenient for writing on than either Egy-
pian papyrus or parchment. On the authority of a certain *Book of Roads and
Provinces*, a text, now lost, probably written by the vizier to the Samanid rulers of
Transoxiana a century earlier, Thaalibi reported the Chinese prisoner story.

Thaalibi's entertaining book belongs to a popular genre of Arabic litera-
ture. In it he sought to match every place with its specialty and a colorful anecdote.
Earlier Muslim historians had ignored the battle of Talas and its repercussions
and instead focused their attention on other events in West Asia. There are,
consequently, no contemporary Arab accounts of the battle, which turned out
to be of inestimable importance: it ultimately determined that Islamic civiliza-
tion would dominate in Turkestan. Later Arab historians, such as Ibn al-Athir
(d. 1233), report that fifty thousand Chinese were killed and about twenty
thousand taken prisoner, but the figures must be fiction. Chinese accounts
contemporary with the battle suggest that the Arab accounts were embellished
and exaggerated over time, for they state that the Chinese army had no more
than thirty thousand troops. Papermakers may have been conscripted into the
Chinese army, however, although only the late Arab sources mention them.
One Chinese source, Du Huan, who was taken prisoner but returned to his
homeland a decade after the battle, mentions only weavers, painters, gold-
smiths, and silversmiths among the prisoners taken.

In any case, papermaking would have been practiced throughout Central
Asia by the eighth century; captured prisoners need not be credited with intro-
ducing it. Paper was used in Samarqand—and probably made there—decades
before the battle. Quite apart from the Ancient Letters, one of which was
addressed to Samarqand some centuries before, several paper documents were
discovered at Mount Mugh, a mountain stronghold near Pendzhikent (Panch)
in Tajikistan, where Devastich, "king of Soghdia and lord of Samarqand," had
sought refuge from the Arab invaders in 722–3. In the 1930s a shepherd dis-
covered a cave in Mount Mugh containing seventy-six texts in Soghdian, Ara-
bic, and Chinese and written on several kinds of material—including paper,
cloth, leather, and wood (fig. 20). Although there is no way to know where the
Mount Mugh papers were made, it is likely that they were local and that, as else-
where, Buddhist monks, who had been active in the region, had brought
papermaking to Transoxiana well before the Muslim conquest.

Al-Nadim, the tenth-century Baghdadi author of a book known as the
Fihrist (Index), which deals with writers and their books, lived somewhat earlier
than Thaalibi, and his near-contemporary account of the origins of paper is
more circumspect. He certainly believed that it was associated with Khurasan,
the province in northeastern Iran adjacent to Transoxiana. "Then there is the Khurasani paper made of flax, which some say appeared in the days of the Umayyads, while others say it was during the Abbasid regime. Some say that it was an ancient product and others say that it is recent. It is stated that craftsmen from China made it in Khurasan in the form of Chinese paper." His reference to Chinese craftsmen may be convention, for Chinese artisans had long been famed in the Islamic lands, and Chinese paper remained esteemed for centuries.

The most convincing argument against the presumed role of Chinese papermakers is technical. By the eighth century papers from western China were made primarily from bast fibers—mulberry, paper mulberry, and ramie—
occasionally combined with hemp, waste fibers from linen (that is, flax), and ramie rags. Raw fibers always predominate, and rag fibers were always only a supplement. Although texts like al-Nadim’s mention making paper from flax, examination of “Islamic” papers shows them to have been made predominantly of rag fibers, with the occasional admixture of raw fibers. Had captured Chinese papermakers been the first to introduce papermaking in Samarkand, they could hardly have perfected using waste fiber so quickly. It is easier to imagine that papermakers had been active in Central Asia for quite some time, where they had learned to use rags rather than bast fiber as their primary raw material. The chief contribution of papermakers working under Arab rule was the perfection of rag paper through improved techniques for beating the fibers and by preparing the surface for writing by sizing it with starch.

The likelihood that anonymous Central Asian papermakers invented rag paper well before the Islamic conquest and that when Central Asia became Islamic, the technology was transferred to the Islamic lands need not entirely discredit the anecdote alleging that Chinese captives brought papermaking technology to Samarkand in 751. But its message should be understood in a metaphoric rather than a literal sense. Much as Cai Lun’s invention of paper remains a convenient metaphor for the underlying truth that paper began to be used for writing in early second-century China, the story of captured Chinese papermakers metaphorically describes how paper was introduced to the Islamic lands through Central Asia just at the time when, under Abbasid rule, this region began to play an increasingly important role in Islamic civilization.