Introduction to Manuscript Studies

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chapter one

writing supports

in the history of writing, every conceivable surface has been used to record the written word, including clay, slate, pottery shards, linen cloth, bark, palm leaves, wood, metal, stone, animal skins, wax, and paper. ancient korean and chinese calligraphers practiced writing characters in sand, on bark, and on polished slabs of jade. jesus was said to have written in the sand with his finger. the predominant writing supports in medieval and early modern europe were parchment made from animal skin and, increasingly from the fourteenth century, paper. this chapter presents the most common writing supports, including papyrus, wax, metal, wood, parchment, and paper and describes how these materials were produced. because of its popularity in the period under study, greatest attention is given to the production of parchment, which was variously used in single sheets for charters, sewn into rolls, and bound into codices, but other media are described as well, as many were employed throughout the period.

papyrus

papyrus was the most widely used writing support in the ancient world (see fig. 1-1). its use spread from egypt to the greek and roman empires; through the romans it was introduced to northern europe. although it continued to be used by the merovingian court until 677 and the papal court until 1587, papyrus was replaced by locally produced parchment in most of western europe when the roman empire collapsed and papyrus became impossible to import. papyrus was made from the pith of the papyrus plant grown almost exclusively in lower egypt. it was made by taking the triangular stalk of the plant, removing the outer bark, and cutting or peeling the underlying substrate or pith away from the lower stem of the plant. the pith was then cut into manageable lengths and sliced into thin strips or fibers. the fibers were placed side by side until they formed a square; then a second layer of fibers was laid on top, at right angles to the first, and the two layers were pounded or pressed together to form a single square. the papyrus had to be wet during this stage so that its gummy sap would bond the sheet together. the sheet was then laid out to dry; once dry, it would be rubbed smooth, and several finished sheets would be pasted together to form a roll.

in a much debated section of pliny's natural history, the first-century roman described the preparation of papyrus to receive writing. not having actually made papyrus, pliny was recording secondhand information. still, his description provides a glimpse into the ancient world's understanding of papyrus production:

papyrus of all kinds is "woven" on a board moistened with water from the nile, muddy liquid supplying the effect of glue. first an upright layer is smeared on to the board, using the full length of papyrus available after the trimmings have been cut off at both ends, and afterwards cross strips complete the lattice-work. the next step is to press it in presses, and the sheets are dried in the sun and then joined together, the next strip used always diminishing in quality down to the worst of all. there are never more than twenty sheets in a roll.

the term recto is used to describe the writing on the inside of the papyrus roll (generally with the fibers running horizontally), and the term verso describes the outside of the roll, with the fibers running verti-

cally. To protect the roll, the first sheet of papyrus either was left entirely blank or had only authentication markings. Rather than presenting a long continuous column of writing from the top of the roll to its end, the papyrus roll was opened from left to right, and each sheet would generally contain two columns of text.

With the decline of the Roman Empire, the means for obtaining papyrus was diminished, and Western Europeans turned to the more readily available and locally produced animal skins. Papyrus continued in use in the West for certain specialized purposes, particularly for documents such as charters, until the eleventh century; the last surviving papyrus papal bull is dated 1057.

**WAX**

Wax was one of the earliest writing materials in the West, employed widely in the ancient world, and its use continued to the nineteenth century. Wax tablets survive from the seventh century AD in Western Europe, while further east, a pair of tablets found in the 1980s in a ship wrecked off the coast of Turkey dates back to the fourteenth century BC. Wax had several advantages as a writing surface: it was inexpensive, it could be easily corrected, and it was impervious to water. Wax tablets had three major functions. First, they were used by students to practice writing and to take notes. (Prudentius, writing in the early fifth century, tells a macabre tale of St. Cassian of Imola, a teacher whose students turned on him and attacked him with the stylus they had been using to take notes on their tablets.) Second, wax tablets were used as an easily correctable surface for rough drafts of written and artistic works that would eventually be copied onto parchment (fig. 1-2). A well-known miniature from a now lost twelfth-century manuscript of the visions of Hildegard of Bingen shows the monk Volmar using a wax tablet for just such a purpose as he jots down the words Hildegard dictated while under divine inspiration. Finally, they were used by the French royal court when the king was traveling. The wax itself was poured into hollowed-out surfaces made from a variety of materials, most often wood, but also ivory and precious metals such as silver and gold; in the thirteenth century, the tablet maker was a documented métier in Paris, and the city’s regulations allowed the use of wood, ivory, and horn for the purpose. Wax tablets made from wood were called tabulæ or pugillares. The wax itself was most often black in color (made by mixing pitch with the melted wax) but could also be green, red, or natural. Letter forms were made on the wax with a stylus made of wood, bone, horn, iron, or silver. One end of the stylus had a point for writing, and the other broadened out to a wider edge that served as an eraser. Individual tablets could be grouped together as a set and kept in a leather case. One of the few surviving examples is a fourteenth-century set of seven ivory tablets and their case, which includes on its exterior a scabbard to hold the stylus. Five of the tablets have been hollowed out for writing on both sides; the outer surface of the first and last tablets in the set is carved with elegant scenes of courtly love. A set of tablets could also be bound together in the fashion of a codex, with several leaves. For example, in the mid-thirteenth century, the accounts of Louis IX were recorded while traveling by his chamberlain Jean Sarrazin on fourteen rectangular tablets that were bound together. The tablets are preserved today in the Archives Nationales in Paris. These were clearly not drafts, given their almost perfect state of preservation and the fact that they were bound together. Wax was a perfect medium for the court as it traveled because it could not be damaged by water as could parchment or paper.

**METAL**

Like wax, metal was relatively impervious to the elements, although, with the exception of soft metals, it was difficult to inscribe. A common metal writing support was lead: it was soft and could be easily pounded into sheets, although any malleable metal could be used, including gold, silver, bronze, and copper. Metal sheets would be written on by striking the surface with a series of straight and curved punches. From the fifth century BC, defixiones, or “binding spells,” used to effect a magic curse were often made of lead, both because it was an inexpensive writing support and because lead was associated with the Roman god of the forge, Vulcan. The lead would be pounded into extremely thin sheets that could be written on with a metal stylus; the sheet was then rolled up, often pierced with a nail, and thrown into a well or buried. The latest lead defixiones that survive date from sixth-century Gaul. Pilgrimage badges were also made of lead or silver, although the text would be stamped with a die much as coins were produced rather than incised with a punch or stylus.

A common use of metal in the Roman Empire was for


diplomas that granted citizenship and other rights to retiring soldiers. The diplomas were made of thin bronze plates. The text was incised on the inside (intus) and then repeated on the outside (extrinseca) of the two plates, with the text on the back written at a right angle to that on the front. The plates were then folded together and sealed with wax. If there was a dispute about the external text of the diploma, a court could break the wax seal and read the inner text.

WOOD

Wood was a cheap writing support that could be prepared in various ways and easily erased for reuse by sanding. In the ancient world, wood was used in cases where long-term survival was not deemed necessary. Such uses included public notices, business transactions, accounts, drafts, practice exercises, informal letters, and invitations. According to Plato, in addition to being used as notebooks, wooden boards were used for ballots, legal records, and votive offerings (prayer requests to be hung in temples). Romans called such boards, whitened with gypsum, *alba*, from which we get the English word *album*. Whitened boards were still in use in the fifteenth century, when Cennino Cennini described how to make them in his artist’s handbook, *Il libro dell’arte*. Cennini recommended that they be made from fig wood and treated with ground bone mixed with saliva; the surface could then be sketched upon by the novice artist using either a silver or brass stylus.5

The word *codex* originally meant a tree trunk and, before it was applied to a parchment book, it designated a set of wooden writing boards linked together into book format. Thanks to a 1986 archaeological find in the Dakhleh Oasis in Egypt, we know quite a lot about how these wooden codices were made.6 The excavations brought to light two codices, a farm account book and a compilation of Isocrates’ *Cyprian Oration*. Both date from around 360 AD and exhibit similar construction, each having originally contained eight boards, or “leaves,” on which writing had been entered. In each case, the entire codex was cut from a single block of wood. The individual leaves are mostly about 2.5 mm thick, the outer leaves (which served as the covers) being a little thicker. When the artisan cut the leaves from the block, he made a mark on one side of the block (the side that would be the spine of the book) to ensure that when the book was finished, the leaves would maintain their original order. This was important, for it meant that, if there were any irregularities in the saw cuts (as it was inevitable there would be), the finished book would still lie flat because adjacent leaves would share the same irregularities in mirror image. The artisan’s mark for this purpose consisted of a V cut across the back of the block.

Each leaf therefore had two notches in it, with the notches set close together on the spine of one cover (at the apex of the V) and becoming progressively further apart on the succeeding leaves; when the leaves were set in their correct order, the V was reconstituted, but if a leaf was put in the wrong place, the design was disturbed. Once the leaves had been cut, they may have received some preparation such as gum arabic to facilitate the adhesion of the ink to the wood. There was writing on both sides of every leaf, except the first and last, which served as covers. The leaves were scored in drypoint, with vertical rulings defining the width of the columns and with just a few horizontal rulings to guide the entering of text (the Isocrates has one horizontal ruling for about every nine lines of text). Six small leather pads were glued to the verso of each leaf except the last (two at top left and right, two at middle left and right, and two at bottom left and right); these pads served to prevent the chafing of one board against another, which would have abraded the text. To hold the book together, a pair of holes was drilled in the upper inner and in the lower inner corners of each board, with one hole in each pair drilled about 25 mm above the other; a cord (a single piece of spun linen) was then loosely threaded through these holes to provide a rudimentary binding. At some point, a corner broke away from one of the leaves of the Isocrates codex, and it was evidently repaired by a method similar to that used in parchment books; although the corner has not survived, a series of tiny holes close to the broken edge of the leaf shows that the corner was once reattached by sewing. It is of the greatest interest that these wooden books, the best-preserved survivors of a genre that must once have been common, display numerous features that would be transferred to the parchment manuscript.

Wood could also be used in the form of bark shaved from trees. Portions of the Qu’ran are said to have been recorded on tree bark. From Roman Britain, several examples of ephemeral texts written on thin sheets of bark survive. Called the Vindolanda tablets after the Roman garrison town just south of Hadrian’s Wall, these wooden supports were preserved from decay because they had been placed in a trough that was later sealed with clay to allow rebuilding. The clay and water created an anaerobic environment that prevented bacteria from destroying the tablets. The Vindolanda tablets are small (roughly 1 mm thick x 9 cm high x 20 cm wide). Many are folded down the middle to protect the text and maintain privacy. They were used for a variety of purposes: to keep accounts, for invitations, for letters, and for practice in writing Latin. They were for the most part written in Roman script.

A common use of wood as a writing surface in medieval England was the tallystick (fig. 1–3). A tally or tallystick is an instrument designed to establish a financial contract; in this case it was a record of money paid into the English exchequer. The tallystick is a wooden chirograph: it was broken in half so that each party would have a record of the transaction (see chap. 14 for a discussion of chirographs). Once the writing and the notching were complete, the tallystick would be broken in half like a wishbone. The payee would receive the larger end, called the tally or stock (stipes); the exchequer kept the smaller half, called the counternot or foil (folium). When the account was made up, the stock was returned to the exchequer. Because the wood broke in a unique way each time, it was virtually impossible to forge a tallystick. Tallysticks were commonly made of hazelwood; the record of the transaction (the money paid or owed) was entered on the surface of the stick. Notches were made to indicate amounts: a notch the width of a man’s palm signified £1,000, a notch the size of a man’s thumb represented £100, and a notch the width of a man’s little finger was £20. A small notch indicated one pound. Shillings and pence were indicated on the opposite side with cuts that did not remove the wood but were simply nicks on the wood. Tallysticks used to record transactions between private persons may differ in form from those produced by the exchequer. In 1783, George III ended the use of tallysticks, although their use continued until the death of the last chamberlain of the exchequer in 1826. William IV ordered the destruction of the remaining tallies, which set off a fire that destroyed the Houses of Parliament in 1834.

PAPER

Paper was in use in Europe well before the advent of printing. It was first made by the Chinese, and its discovery is usually attributed to Ts’ai Lun in 105 AD, although recent archaeological discoveries indicate its use up to two hundred years before that. The oldest surviving paper documents are Buddhist texts from the second and third centuries, currently in the British Library. Subsequently, the technology was exported east to Japan through Korea and west through the Arab world. It reached Moorish Spain in the eleventh century; by the middle of the twelfth century, an important mill was in operation at Játiva, near Valencia, where Jews participated in paper production. Arabic paper, as well as paper made in Spain in the Arabic fashion, was beaten with pestles and sized with starch. It generally lacked a watermark and had long fibers. Twelfth-century books on paper survive, but the origin of the paper is unknown. Prior to its production in Spain and then Italy, paper was imported from Arab countries, but this imported paper, although inexpensive, was of inferior quality compared with parchment and was thus not widely used. The 1231 constitutions of Melfi imposed by Frederick II on the kingdom of Sicily, which because of its location had easy access to Arab paper, forbade the use of paper for documents having legal authority (“Ex instrumentis in chartis papiris scriptis nulla omnino probatio assumatur”), and the 1265 Ordinance of Alfonso X of Castille made a distinction between “cartas las unas factas en pergaminio de cuero e las otras en pergaminio de paño” (charters made on leather parchment and cloth parchment, i.e., paper). Emperor Frederick II forbade the use of paper “quoniam incipiebat vetustate consumi” (because it was beginning to show signs of age).

Writing in the twelfth century, Peter the Venerable, abbot of Cluny, was even more scathing. Referring most likely to the Arabic paper produced in Spain and linking the paper with its Jewish producers, Peter commented:

God, it says, reads the book of Talmud in Heaven. But what kind of a book? Is it the kind we have in daily use, made from the skins of rams, goats, or calves? Or, is it made from reeds and rushes out of Eastern swamps, or from old rags, or from some other more vile material, and written upon with birds’ quills or reed pens from swamps, dipped in any kind of ink?"
A lingering suspicion of paper can be seen in the decision of many wealthy collectors to have printed books copied onto parchment and in the words of Johannes Trithemius (1462–1516), who mourned the loss of manuscript culture caused by print: “If writing is put on parchment it may last for a thousand years, but how long is it going to last if it is printed on such a thing as paper?” Parchment was also linked to prestige, while paper was seen as a cheap substitute and hence many high-status printed books were printed on parchment rather than paper.

In Italy, the first paper mill seems to have been established in Fabriano in the Apennine Marche region around 1268–76, although 1283 is the earliest date recorded of the use of the term “papermaker” in a legal document. Several improvements in paper production in Italy led to its being accepted as a suitable substitute for parchment: more finely ground pulp from metal beaters often powered by water, the use of gelatin as sizing material, short fibers, and watermarks. However, these refinements also made Italian-produced paper very expensive, inhibiting widespread adoption until prices dropped at the end of the fourteenth century. Figures quoted by Blum from an Italian account book of 1382 suggest that by then, the price of paper had dropped to about one-sixth the price of parchment. From Italy papermaking seems to have spread to France in the mid to late fourteenth century and to Germany at the end of the fourteenth century. The first paper mill in England is purported to have been the John Tate mill (established in 1496), which produced paper used by early printer Wynkyn de Worde, among others.

Paper is made from cellulose (flax, hemp, linen), which in late medieval Europe was usually obtained from cloth rags or ship sails (as well as recycled scrap paper). The materials were moistened and pressed into great balls or placed en masse into a special vat, where they would ferment for a period of between six weeks and two months. This process, called retting, weakened the fiber and prepared it for maceration. The resultant digested material was then placed in a water-powered stamping mill, consisting of large stone or wood vats with wooden beaters, which would beat the material into a usable pulp. The slurry would then be cleaned and transferred to a vat or tub, usually by hand. The vatman would then dip a screen tray called a papermold into the vat, the contents of which would be agitated by another worker with a pole. The vatman would scoop up a thin layer of pulp, allowing the excess to return to the vat; he would then shake the mold in both directions (right and left, forward and backward) to evenly coat the bottom of the mold and to cause the fibers to cross and mat. The bottom of the mold was a wire sieve or screen that allowed the water to pass through while retaining the pulp. The wire sieve left marks that are apparent on all medieval paper: the long vertical sewing wires left marks called chain-lines, while the smaller, more numerous horizontal wires left marks called laid-lines. The mold had a removable rim called a deckle that contained the pulp and set the size of the sheet. After the pulp was spread on the mold, the deckle would be removed. The paper was allowed to dry and was taken off the mold by a second artisan, called the coucher, and placed by a third artisan, the layman, on a pile of sheets that would then be pressed to remove as much water as possible (fig. 1–4).

There is at present a debate as to whether or not felt was used to separate the sheets of paper while they were being pressed. The sheets would be separated, restacked, and repressed several times, until the desired smoothness was achieved, and hung out to dry in stacks of four or five sheets (to prevent curling and wrinkling) on ropes coated with beeswax. Eventually drying houses were built to accommodate drying space for large production runs of paper. Finally, the paper would be dipped in size, usually gelatin made by boiling parchment and leather, and pressed to remove the excess. The sizing prevented the paper from absorbing water and ink, gave it more heft, and increased its durability. Gelatin sizing also made the paper more

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suitable for writing with acidic ink (Asian papers were unsized because the lampblack ink used by calligraphers was thicker and not easily absorbed by the paper). The paper would be allowed to dry again and then burnished by hand. Paper made in this fashion was strong and long-lasting and of great value.

Knowledge about the manufacture of paper can provide information about the production and provenance of the books in which it is found (see further in chap. 8). Each papermold was unique. Rather than using one mold, most papermakers used two nearly identical molds to make paper, doubling the amount of paper that could be produced at a given time. The structure of the screens at the bottom of the molds (that is, the pattern of chain-lines and laid-lines) is readily apparent in most papers made by this method.

Watermarks were commonly used to identify paper. Watermarks survive on paper from as early as 1282, and they became increasingly common in later centuries. An emblem sewn with wire onto the mesh created the watermark (French filigrane, from the Latin filum, [thread or wire] and granum [grain]; German Wasserzeichen; Dutch papiermerken). The emblem was higher than the chains and lay wires, so the resulting paper was thinner over the emblem itself. Because they have a lower density than the surrounding paper, watermarks can be seen by applying a contrasting agent, usually by passing light through the paper. The emblems were made either by the mold maker or, for more complex images, by goldsmiths or other fine metalworkers. While emblems were sometimes placed in the middle of the sheet, most often there were two emblems, one placed in the middle of each half-sheet of paper (fig. 1-5).

Watermarks seem to have functioned first and foremost to identify the papermaker and to prevent one papermaker from passing off his work as another’s. They may also have had a symbolic value, functioning as emblems that expressed some information about the values, beliefs, or self-perception of the papermaker or his membership in a guild or brotherhood. Especially popular as watermarks were images of bulls’ heads, religious objects and symbols, and mythical creatures. Blum believed that the

1-5 Scorpion watermark (Briquet 13610). The chain- and laid-lines are easily visible. The brighter areas on the emblem may indicate places where the device was affixed to the screen or where repairs were made to it. Newberry Library, MS 65.

1-6 A Florentine ricordanza belonging to Pepo degli Albizzi written between 1339 and 1360. Note the brightly colored leather binding that serves to enclose and protect the contents; a flap extends from the back cover and buckles to the front. Pepo added his X to his initials on the front cover to form the word pax. Newberry Library, MS 27.
embraces were intended to indicate the brands of paper, the location of the mill, the quality of the paper, and the physical size of the sheet. These uses were legislated in the late fourteenth and, to a greater extent, during the fifteenth century, but knowledge of earlier practice remains vague. Hunter believed that watermarks must be viewed with suspicion as evidence of date or location of production, because a dated watermark could be used over a number of years, and papermolds were often transferred from one maker to another without the watermark's being changed. Nevertheless, some significant discoveries have been made from the study of watermarks (see chap. 8).

In the late Middle Ages, paper was sometimes sold to the prospective user not in sets of sheets that would first be written on and then bound but as prebound books. Such books would then be used for practical purposes: as account books, inventories, journals, and the like. The colorful Florentine Registers are a case in point: they were sold prebound with ornate leather covers in various colors, and merchants would record their personal business affairs, often using a different colored register for each new year (fig. 1–6). Inventories were also composed in prebound booklets (i.e., books having only one gathering of sheets) and were clearly sold in various sizes and shapes, as notebooks are today. They might have a limp vellum cover (see chap. 4, fig. 4–7) or no cover at all. When paper books were bound, there seems to have been little concern about the direction in which the watermark was oriented, although it was customary to bind the pages so that the more distinct chain-lines had a vertical orientation and the more frequent laid-lines had a horizontal orientation and could be used almost as ruling.

PARCHMENT

Parchment is literally the substrate upon which virtually all knowledge of the Middle Ages has been transmitted to us. It is vital to know how it was prepared in order to understand how medieval people communicated with each other and with posterity. This section on parchment explains the general preparation of parchment; there were, of course, innumerable subtleties and differences in actual production, but the section should provide the basic information needed. Knowledge about parchment preparation can assist in establishing the date, provenance, and authenticity of the written record; its material history is as important as the text or image it transmits.

The great majority of medieval manuscripts were written on parchment, that is, on animal skins specially prepared to make them a surface suitable to serve as a writing support. Reputedly invented in Asia Minor by King Eumenes II of Pergamum (whence Latin pergamentum, “parchment”) in the second century BC, parchment had largely replaced papyrus, the favored writing support of the ancient world, by the fourth century AD, although, as noted above, papyrus was retained for certain special purposes as late as the eleventh century. Even with the expansion of paper production in Western Europe from the fourteenth century, parchment continued to be widely used, and it remained the writing support of choice for manuscripts of higher status. It was the most valued support for early printed books for those who could afford to have them printed on parchment; its use for such purposes continued into the twentieth century.

Types of Skin

The skins most commonly used for parchment were calf, sheep, and goat. Calf gave the best-quality parchment, although much depended on the nature of the preparation. Parchment made from calf and sheep was common in northern European manuscripts; goatskin was widely used in Italy. No doubt the skins of other animals were also used on occasion. Recognizing the species from which a sheet of parchment was made is difficult because a characteristic that may at first sight appear to be an indication of the type of skin used can in fact be the result of the method of preparation; this is especially true for the early medieval period, when the method of preparation used in the British Isles (and in certain continental centers founded by Irish and Anglo-Saxon missionaries) was significantly different from that of continental producers. A general guideline—to be observed with some caution—is that parchment made from calfskin tends to be whiter or creamier in color and may show a prominent pattern of veins; parchment prepared from sheepskin is often yellowish and may be somewhat greasy or shiny in some areas (see figs. 1–7 and 1–8).

Terminology

The terms most commonly used to refer to writing supports prepared from animal skins are parchment and vellum. Some scholars use the terms interchangeably, which can lead to confusion. The term vellum derives from Latin vitellum, French vélin, meaning “of calf”/“made from calf”; strictly speaking, therefore, this term should be used only for writing supports prepared from calfskin. In view of this, some scholars prefer to reserve the term parchment (which etymologically has no such specific connection) for supports prepared from sheep- or goatskins. Yet another system is observed by modern parchment makers and calligraphers, who use parchment and vellum to refer to writing supports of different thicknesses and degrees of preparation, without reference to the animals from which the skins come. To avoid the potential confusion, some scholars prefer to use the neutral term membrane to refer to a writing support made from animal skin, particularly if they are unsure of the species of origin. In this book,
parchment is used generically to refer to any writing support prepared from animal skin, while vellum refers specifically to parchment that has been prepared from calfskin.

Method of Preparation

Before a skin was turned into parchment, it had to be thoroughly cleaned and dehaired. First, the skin was washed in water and then soaked for several days in a bath of lime solution to loosen the hair (see fig. 1–9). Next, the parchment maker would remove the loosened hair. Modern parchment makers who follow traditional practices remove the hair by placing the skin over a beam of wood, first using their hands (gloved to protect them from the caustic action of any lime solution remaining on the skin) to pull out as much hair as they can (see fig. 1–10). Then, to remove any remaining hair, they work the skin with a gently curved, two-handled blade, a process that is called scudding (see fig. 1–11).

Once the hair had been removed, the skin was washed again in water, after which came the critical stage in the process to turn the skin into a material suitable for writing upon: drying the skin under tension, while it was stretched on a frame. In contrast to the method used to turn a skin into leather—a chemical process involving the use of tanning or tawing agents—parchment making was a physical process that produced a change in the character of the skin. As the skin dried, it sought to shrink. Stretched tightly on the frame, however, it could not reduce its surface area. Instead, the structure of the skin began to change, the fiber network reorganizing itself into a thin, highly stressed
laminal structure that became permanently set as the skin dried.

The frame on which the parchment maker suspended the skin is called a herse; medieval evidence, both visual and written, indicates that the herse was sometimes square, sometimes round (see fig. 1-12 and compare the description quoted below). The parchment maker attached the skin to the frame by tying cord to the skin at several points around its circumference. To prevent the cord tearing the skin, modern practitioners—in all likelihood recreating medieval practice—first wrap the area of skin to which the cord is to be attached around a small, round pebble, called a pippin, then tie the cord around the knobbled area thus produced (see fig. 1-13). They then attach the other end of each length of cord to a peg with a rectangular head inserted into the frame. As the skin dries, the pegs are continually tightened up with a handle, much like a wrench, specially shaped to fit over the top of the pegs (see fig. 1-14).

While the skin was stretched upon the frame, the medieval parchment maker worked on it with a crescent-shaped blade called a lunarium or lunellum (“little moon”; see fig. 1-15). It was important to use a blade with a curving edge: as the skin “gave” somewhat under the pressure of the blade, the curve followed its contour where a straight blade might rip the skin. The parchment maker worked on both sides of the skin to remove any remaining hair from the outer surface (the hair-side) and any remaining fat and flesh from the inner surface (the flesh-side). Once the skin was completely clean and dry, it was removed from the frame and was ready to be cut into sheets of parchment. The number of sheets a single skin could provide depended, of course, on the size of the skin and the dimensions to which the sheets were cut. On average, a calf-skin might provide about three-and-a-half sheets of parchment of medium size. Each sheet was folded in two to form a bifolium, two conjoint leaves. The half-sheet that was left over would serve for a single leaf; not uncommonly a quire included two single leaves as well as several bifolia (see below, under “Forming the Sheets into Quires”). In a finished sheet of parchment, it is sometimes possible to see the line of the animal’s backbone, which may appear darker where it is marked by a clustering of hair follicles (see fig. 1-16).

A thirteenth-century recipe for parchment making that includes all the steps outlined above occurs in a German manuscript now in the British Library, London (MS Harley 3915, fol. 148r):

To make parchment from goatskins in the Bolognese manner, take goatskins, and put them in water for a day and a night. Then take them out, and wash them until the water runs out clear. Then take a completely new container, and put in it lime that is not fresh, and water, and mix them well together, so that the water is good and thick. Then put the skins in, and fold them over on the flesh-side. Then stir them with a stick two or three times a day, and let them stand like this for eight days in summer, and for twice as long in winter. After this, take them out and dejair them. Then get rid of the entire mixture in the container, and replace it with another batch of the same quantity of the same mixture. Put the skins in again and stir them, and let them be turned each day just as previously, for another eight days. Then take them out and wash them very vigorously, so that the water runs out really clear. Then put them in fresh water in another container and let them stand for two days. Then take them out and
attach cords to them, and tie them in hoops, and prepare them with a sharp iron blade. Then let them stand for two days out of the sun. When all the water has been extracted, and the flesh has been removed with pumice, after two days dampen them again, sprinkling a smallish amount of water on them, and cleaning off with pumice all the flesh that has thus been dampened. Then suspend them with cord more exactly and evenly, according to the shape that they are to retain as parchment; and then there remains nothing more to do once they have dried.\textsuperscript{13}

**Defects in Skins**

Quite commonly, especially in manuscripts of lesser quality, some leaves are not fully rectangular but have one curving, defective edge. Such defective edges resulted when the skin was being cut into sheets and it happened that there was not enough skin left to provide a full rectangular sheet; the defective edge marks a contour of the original skin—for example, the neck or shoulder line. When sheets with defective edges were used in a manuscript, the defective edge would generally be turned so that it occurred in the lower outer area of the leaf (see fig. 1-17). Usually, defective edges were left unrepaired. However, in the example pictured in figure 1-18, from a manuscript produced at Llanbadarn Fawr, Wales, in the late eleventh century, a defective edge has been carefully cut into a stepped shape, then repaired with a parchment patch of the same shape. The patch, which just overlaps the edge of the original leaf, was laced to the leaf with a narrow strip of parchment that was partly colored with a red pigment that subsequently corroded and darkened. In this case, because the defective edge was shaped by hand, it is not possible to tell whether it was the result of an original defect in the skin or of subsequent damage to the leaf.

It is also common to find on some leaves of a manuscript holes that already existed in the skin at the time the animal was slaughtered. Such holes vary from the tiny, resulting from insect bites, to those that may span several lines of script, resulting from some injury to the animal. Sometimes, if the bite or injury was in the process of healing at the time of slaughter, it is possible to see an area of thinner scar tissue across part or all of the hole. Typically there are more leaves with holes toward the end of a manuscript than earlier on, an apparent sign that as the task of copying the manuscript approached its end, the scriptorium grew less selective in its choice of sheets and was prepared to use whatever came to hand.

Holes resulting from bites or injuries to the animal from which the parchment was prepared are easily distinguished from other types of damage, such as wormholes, that were acquired only after the manuscript had been completed. The scribe writing the text of the manuscript was of course obliged to enter the text around any holes that were already present at the time of writing, often having to di-

\textsuperscript{13} The original Latin text is quoted in Daniel V. Thompson, "Medieval Parchment-Making," *The Library*, 4th ser., 16 (1935): 113–17, at 114.
vide words in the process (see figs. 1-19 and 1-20). Holes produced by woodworm, on the other hand, are easily recognized when the holes have resulted in the loss of portions of letters through which the worm ate (see chap. 7, fig. 7-5). Also, since wormholes usually occur across a span of several consecutive leaves, if a hole or a pattern of holes in one leaf can be matched on the immediately preceding or succeeding leaf or leaves, that is a sure sign that the damage has been caused by woodworm.

Normally, holes that were already in leaves at the time of writing were left unrepaired (although sometimes scribes cut them into more regular or more decorative shapes). Occasionally, however, a large hole might be patched with parchment. Very unusually, in Cambridge, Corpus Christi College, MS 286 (the “Gospels of St. Augustine of Canterbury”), a manuscript written in Italy in the mid-sixth century, numerous small holes have been repaired with a fine, transparent adhesive membrane, perhaps fish's bladder (see fig. 1-21). The repairs must have been made before the scribe wrote the text, for in some places the scribe's ink extends onto the tissue used for the repairs (see fig. 1-22).

Another form of damage commonly encountered in the leaves of manuscripts consists of gashes that may have been produced at the time the skin was flayed from the animal. Often such gashes were sewn together with thread; sometimes the thread still remains (fig. 1-23), but in many cases it was subsequently removed, with only the needle holes remaining to attest to the former repair (fig. 1-24). Such repairs were often made while the skin was stretched on the parchment maker's frame. If the needle holes around a gash are oval rather than fully round, that is an indication that the repair was made on the frame, the holes having been stretched into their oval shape while the skin dried under tension.
PREPARATIONS PRIOR TO WRITING

Forming the Sheets into Quires

Once the prepared skins had been cut into sheets of parchment, there were various operations to be performed before the scribe could begin to write. First, he or she would group several sheets together to form a *quire* (also called a *gathering*). The quire was the scribe’s basic writing unit throughout the Middle Ages; it was generally true that only when all the quires of a manuscript had been written would the manuscript be bound (but see above and fig. 1–6 for cases of prebound paper “notebooks” in the late Middle Ages). Quires of various sizes were made throughout the Middle Ages. The most common sizes were quires of eight leaves (for which the Latin term was *quaternio*, plural *quaterniones*; see fig. 1–25) or ten leaves (*quinio*, plural *quiniones*). Quires of these sizes could be made by folding four or five sheets (*bifolia*) in two to produce eight or ten leaves, with each leaf in the first half of the quire being joined to its partner in the second half. Quite frequently, however, quires would not consist entirely of bifolia but would include two half-sheets (that is, single leaves) in place of a bifolium. In this way, a scriptorium could use those smaller pieces of parchment that might be left over when the full sheets were cut from the prepared skin. When a quire included two single leaves, those leaves were not placed at the beginning of the quire or at its midpoint, where they would be vulnerable and might more easily be lost or removed, but somewhere in between: in a quire of eight leaves, they would be placed in second and seventh or third and sixth positions, firmly anchored between the outer and inner leaves of the quire (see fig. 1–26). Each single leaf would include a stub that the scribe would fold around the spine of the next leaf so that the single leaf, like the bifolia, would have a gutter into which the binder could insert his needle when sewing the quires of the manuscript to its sewing supports at the time of binding. The projection of a stub between the immediately preceding and succeeding leaves is a sure sign of the presence of a single leaf in the quire.

In forming the quire, the scribe would decide how to arrange the hair- and flesh-sides of the sheets. It is normally simple enough to recognize the hair-side of a leaf: usually it is possible to see a clustering of hair follicles in one or another area of the leaf (see fig. 1–27). In continental European manuscripts of the Carolingian period, the hair-side frequently has an easily visible “peppering” of hair follicles all over its surface. The hair-side also tends to be darker in color than the flesh-side. The normal practice in Western Europe throughout the Middle Ages—but not in the early medieval British Isles or in certain continental centers founded by Irish and Anglo-Saxon missionaries (for which see below)—was to arrange the sheets so that, wherever the finished manuscript was opened, like sides would face one another across the opening: that is, hairside would face hair-side or flesh-side would face flesh-side. This arrangement could be achieved by using either of two methods. One method was to take the precut bifolia, and for a quire of eight leaves, place the first sheet hairside downward, the second sheet flesh-side downward, the third sheet hair-side downward, and the fourth sheet flesh-side downward (a quire of ten leaves would require a fifth sheet, placed hair-side downward). Then the sheets would be folded on the vertical axis to produce a quire in which like surfaces faced one another throughout. The alternative method to produce the same effect—a method certainly used on occasion and perhaps frequently—was more appropriate for manuscripts of smaller size. The scribe could take a large sheet of parchment, fold it in
two once, then fold it in two a second and third time, then make cuts along the appropriate edges: the result would be a quire of eight leaves in which like always faced like (fig. 1–8 illustrates this method for a quire of four leaves; one additional fold at stage three would produce a quire of eight leaves). For most of the Middle Ages, scribes who used either of these methods generally preferred to arrange the leaves so that the outside of the quire was a hair-side. This was not, however, the practice in late antiquity, when quires generally had a flesh-side on the outside; many humanist scribes of the fifteenth century reverted to the late antique practice by forming their quires so that the outermost sheet of the quire was a flesh-side.

The arrangement of hair- and flesh-sides was different in manuscripts produced in the British Isles up until the late tenth or early eleventh century. This variant practice may have been connected to the fact that the “Insular” method of preparing parchment gave a finished product in which the difference in appearance between hair- and flesh-sides was less pronounced than in continental parchment; to have unlike surfaces facing one another was, as a result, not aesthetically displeasing. When Insular scribes formed the sheets into quires, they oriented the sheets so that, except at the middle of the quire, a hair-side would face a flesh-side or a flesh-side would face a hair-side. To achieve this arrangement, the sheets of the quire were laid with the same side always placed downward as the pile was formed. Usually it was the hair-side that was laid downward, so that when the fold was made, a hair-side would be on the outside of the quire as its first and last page; whereas, however, some quires in Insular manuscripts in which the flesh-side is on the outside. This method of forming the quires was also practiced for some time in continental centers founded by Irish and Anglo-Saxon missionaries (for example, Fulda in Germany and Bobbio in northern Italy). Beginning in the late tenth century, however, Insular scribes dropped their earlier practice and adopted the continental method by arranging the sheets so that like sides faced one another across openings.

Once the quire had been formed, the scribe might then lightly tie the leaves together with thread or a narrow strip of parchment in order to keep them united as a group during the writing process. This is called tacketing. Needle holes and lengths of thread or twists of parchment for tacketing have been discovered in numerous manuscripts, usually in the upper inner area of the leaves.

1-28 Diagram showing how a four-leaf quire could be produced by making two folds in a large sheet of parchment.

Pricking and Ruling the Leaves

Before beginning to write, the scribe would rule the leaves. Throughout the Middle Ages, scribes pricked small holes in the margins of the leaves to guide their horizontal and vertical rulings (see fig. 1–29). In many cases the prickings can still be seen on the leaves, but those in the outer margins were often lost when the edges of the leaves were trimmed at the time of binding. Scribes might make the prickings with a knife, an awl, or a compass: a knife would leave small slits in the parchment, while an awl or compass would leave rounded holes. To keep the line of prickings more or less straight, scribes would place a ruler on the margin to be pricked and use it as a guide, bringing the pricking instrument right up against, or close to, the ruler. Generally, scribes would prick a group of several leaves together, forcing the pricking implement through the upper leaf to the leaves below; the prickings would then be smaller and less visible on the leaves that were lower in the pile. There is evidence that some scribes pricked by using a small revolving, spiked wheel attached to a handle: in this case, the scribe would simply draw the wheel down the margin in
order to leave a line of pricks. In some cases, scribes would press the parchment down onto a frame set with nails that would prick the parchment.\textsuperscript{14}

The scribe could prick and rule the sheets of parchment either before or after folding them to form a pair of leaves. If pricking and ruling came first, then for the horizontal rulings the scribe only needed to make prickings at the far left and right of the sheet, that is, in what would be the outer margins of the individual leaves once the sheets had been folded. But if the scribe first folded the sheets and only then pricked and ruled them, it was necessary to make a line of prickings in both the inner and the outer margin of each individual leaf. In the early Middle Ages—just as had been the case with the arrangement of hair- and flesh-sides—there was a difference in practice between continental Europe and the British Isles (and continental centers under Insular influence). On the Continent, the sheets were ruled before folding, so for the horizontal rulings only the outer margins were pricked. Up until the late ninth century, however, the common Insular practice was to fold the sheets first and then rule; pricks were therefore made in both the inner and the outer margins of each leaf. After the late ninth century, Insular practice for pricking matched that on the continent, with pricks being made before folding, in the outer margins only. Then, for a period of about one hundred years between the mid-twelfth and the mid-thirteenth century, both on the Continent and in the British Isles, it became normal practice to prick and rule only after folding, with pricks being made in inner and outer margins; thereafter scribes reverted to pricking in the outer margin only, before folding.

In addition to making vertical lines of pricks to guide the horizontal rulings, the scribe would also make pricks in the upper and lower margins to establish guides for the vertical rulings of the page. The number of vertical rulings made would depend on whether the text was to be laid out in a single column or in double or multiple columns. Normally, for a single-column manuscript, the scribe would rule a pair of vertical lines close together (about 5–7 mm apart) at both the left and the right edges of the page. These vertical rulings defined the width of the column. The scribe would begin each line of ordinary text immediately to the right of the inner of the two lines at the left side of the page. The space between the pair of lines at the left would be used for entering initials beginning sections of text. The pair of lines at the right of the column served to guide the entering of initials on the reverse side of the leaf. When making the horizontal rulings, the scribe would normally rule the top and bottom one, two, or three lines the full width of the leaf, extending these lines beyond the vertical rulings to the very edge of the leaf; a few manuscripts also have one or more lines in the middle of the page ruled the full width. The scribe would rule the other lines only between the innermost rulings of each of the pairs of vertical rulings at the left and right of the page (see fig. 1–30). More complicated patterns of pricking and ruling occur in manuscripts where the text was laid out in two or more columns to the page (see fig. 1–31) or in manuscripts containing tables.

Scribal practices for ruling varied from one period of the Middle Ages to another. In the early period, up until a time of transition beginning in the late eleventh century, ruling was in drypoint, that is, it was made by pressing into the page with a knife or stylus made of metal or bone. Occasionally an overenthusiastic scribe might even cut through the parchment when ruling in drypoint. For drypoint ruling, only one side of a leaf needed to be ruled; furrows were made on that side and ridges appeared on the other. It was also possible to rule more than one leaf at a time by assembling a batch of leaves in a pile and pressing hard so that the ruling on the top leaf would show through on the leaves below. The rulings would, however, become progressively fainter on the lower leaves, and sometimes it was necessary to rerule the leaves at the bottom of the pile to produce a ruling that the scribe could use.

From the late eleventh century, drypoint ruling began to be replaced by ruling in plummet (leadpoint). The

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\textsuperscript{14} For a lucid description of different medieval practices for pricking manuscripts, see Leslie Webber Jones, "Pricking Manuscripts: The Instruments and Their Significance," \textit{Speculum} 21 (1946): 389–403.
transition from drypoint to plummet, however, occurred over several decades, and manuscripts ruled in drypoint can be found as late as the third quarter of the twelfth century. Plummets ruling is either gray or reddish-brown in color; it leaves a thin, somewhat granular and sometimes barely visible line on the page (see fig. 1-31). A scribe who ruled in plummet (and indeed in any medium other than drypoint) was obliged to rule both sides of the leaf and could not rule more than one leaf at a time. In the fourteenth and fifteenth centuries, ruling in ink (usually of the same color as that used for the text but sometimes of other colors) became quite common. Humanist scribes of the fifteenth century frequently reverted to the practice of ruling in drypoint as part of their conscious revival of earlier scribal and codicological practices. With the sheets of parchment grouped into quires and each leaf pricked and ruled, the scribe could begin to enter text upon the leaves. The process by which the manuscript received its text and any accompanying decoration is described in the next chapter.