CHAPTER 5
Then [Arthur Upham] Pope asked Ustad [a master mason from Isfahan] details of building a brick squinch. He seemed stumped. So I handed him a sheet of paper and a pencil. He held them at arm's length, a look of total hopelessness on his . . . face. . . . He was illiterate: more, he was incapable of presenting a three-dimensional object in two flat dimensions. He put the pencil aside, then folded the paper intricately to construct an actual squinch. —Jay Gluck and Noël Silverman, eds., Surveyors of Persian Art

Once paper was available in the Islamic lands, artists and artisans eventually came to exploit its possibilities, but they were somewhat slower to do so than were writers, mathematicians, geographers, and merchants. Before paper, artists and artisans worked directly with their chosen materials—clay, bronze, cloth, brick, plaster—relying on experience and practice to do what we would use instructions and drawings to do today. With the dissemination of paper this changed. Gradually some artisans developed vocabularies of representation, but learning how to do something by reading about it in a book remains a distinctly modern practice.

Paper began to be used as an adjunct in the production of art in the eastern Islamic lands—particularly northwestern Iran and Central Asia, the regions where it had been known the longest—as early as the tenth century, but it is only from the thirteenth century that paper became significant in the making of art and architecture. From this time on, increasing numbers of artisans and artists exploited the possibilities of paper for making preliminary sketches and plans for the production of finished works of art. Eventually many of the most characteristic features of later Islamic art, such as the ready transferral of designs from one medium to another, were developed through the use of paper and paper-based patterns.

The major reason that visual artists were so tardy to use paper was their low social status in Islamic culture. Calligraphers, who practiced the only form of visual art universally accepted in Islamic culture, were familiar with paper and highly literate, but weavers, metalworkers, potters, painters, and other craftworkers occupied a relatively low position in medieval times. Because paper was relatively expensive and necessarily restricted to the literate strata, artisans were no more likely than any other low-status and poorly paid individuals to have had much access to or familiarity with books or with the idea of executing drawings on the new medium. Indeed, they did not need paper to do their work. As paper became cheaper and increasingly available, however, they discovered and exploited new ways of using it, thereby transforming the visual world of Islam.
The slowness with which artists in the Islamic lands took up the use of paper reveals a process largely obscured in the West, where its use spread rapidly in the fifteenth and sixteenth centuries through its close association with printing. In the Islamic lands, in contrast, printing was not adopted until the end of the eighteenth and nineteenth centuries, so increased access to paper led only gradually to changes in the ways art was made.

That art could be, and sometimes was, figural. A popular Western misconception holds that Islam prohibits the representation of living beings in its art, but every public or private collection of Islamic art has scores of textiles, ceramics, metalwares, and pages from books bearing images of real and imaginary creatures. These images, made in many Islamic lands over the fourteen centuries since the rise of Islam, testify to a long and vibrant tradition of representation. It is religious art that is nonfigural, in contrast to Christian religious art, which is often figural and based on Christian Scripture. Muslims never illustrated the Koran, for the physical text itself was already the only conceivable representation of God’s message. Therefore, although the art of book illustration in the Christian world—medieval Europe and the Byzantine empire—grew out of religious representations, the art of Islamic book illustration was an entirely secular development. The history of this art is quite distinct from the history of the Koran manuscripts copied on parchment and paper, already discussed in Chapter 3. Secular Islamic books were copied almost exclusively on paper, but the role of paper in the arts of the Islamic lands went far beyond books.

**BEFORE THE THIRTEENTH CENTURY**

The illustrated book is a characteristic type of later Islamic art, but the word *later* requires emphasis here. Although hundreds of Islamic manuscripts copied before the mid-thirteenth century survive, only about three dozen are illustrated, and of these only three date from before the twelfth century. Books and book learning may have flourished from the ninth century and inspired the development of systems of notation, but manuscripts illustrated for the sheer pleasure the art would provide—as opposed to scientific and technical works requiring illustrations—were quite rare in early Islamic times. The emergence of the distinctive visual language of representation used in Arabic manuscripts followed, rather than accompanied, the first flowering of book culture, because it was first developed not on paper but in other media.

Because geographical, scientific, and technical works were routinely illustrated in antiquity, it is logical to assume that writers and translators of such works in early Islamic times simply continued ancient tradition. Before the introduction of paper, authors in the Islamic lands may therefore have pro-
duced illustrated texts on parchment or papyrus, although none has survived. If we consider, however, that Islamic interest in the ancient sciences did not burgeon until the ninth century, with the introduction and spread of paper, it is more likely that the development of scientific illustration in the Islamic lands was itself a function of the increased production of books and wider use of paper.

The three earliest illustrated books to survive are indeed all scientific texts in which the illustrations are essential for understanding the text. All were copied on paper. The oldest set of illustrations is found in the 1009–10 copy of al-Sufi’s *Treatise on the Fixed Stars*, discussed in Chapter 4. The second oldest illustrated manuscript is the copy, dated 1037, of the geography written some two centuries earlier by the noted mathematician and geographer Muhammad ibn Musa al-Khwarizmi, also discussed in Chapter 4. Art historians usually ignore it because its pictures contain no people. The third illustrated manuscript is an Arabic translation, dated 1083, of *De materia medica*, written a thousand years earlier by the Greek physician and pharmacologist Dioscorides. Most of the pictures in this manuscript show just plants; the sole figural painting, demonstrating the pharmaceutical use of a plant, was modeled on a Greek prototype.

In addition to these three manuscripts, several fragments apparently from illustrated books have been discovered, primarily in the course of rogue excavations in the rubbish heaps of Fustat (Old Cairo) in Egypt. The earliest, a fragment in Vienna, has been dated on paleographic grounds to the late ninth or early tenth century, but the illustration is only a simple schematic drawing (fig. 58). Like the unillustrated *Thousand Nights* fragment in Chicago (see fig. 26), also discovered in Egypt, the Vienna fragment consists of a worn sheet of paper, measuring only about 6 inches square (16 by 14.5 centimeters) when open and representing, when folded, the first and last leaves of a gathering of
Fig. 59. Drawing of a lion with three lines of text from a discourse on wild animals by Ka‘b al-Ahbar. Egypt, 11th or 12th century. Ink and color on paper. The Metropolitan Museum of Art, New York, Rogers Fund, 1954 (54.108.3)

pages. The text begins on the front of folio 1 with the standard invocation at the start of a written text and concludes on the back of the last folio with "... until death did them part. This is their tomb, may God have mercy upon them"; the text is followed by a crude painting of two stepped tombs separated by a tree. There is no way to tell how much text is missing between the first and last pages of the gathering—though probably not much, because of its size—or whether the booklet had any other illustrations. The simplicity of the image and its technique, combined with the small size of the text, confirm that this was a popular romance of no great artistic importance. The copyist probably inserted the illustration to fill up the blank space on the page. The text itself
belongs to a well-known literary genre of stories concerning unhappy lovers united only in death. In the Fihrist, al-Nadim classifies this type of story in the genre of night entertainments and fanciful tales, and such works—although no others have survived—appear to have enjoyed great popularity under the Abbasids in the early tenth century, the time to which the fragment is generally dated in the absence of any archaeological evidence.

Other fragments of paper found at Fustat bear more sophisticated drawings, which some scholars have interpreted as evidence for a lost early Islamic art of the book. In fact, few of them bear both text and pictures. For those that do, the only conclusions that can be drawn are equivocal, because none is dated, and many raise troubling questions about authenticity. One fragment, for example, bears an almost calligraphic drawing of a lion on one side. The drawing is accompanied by a few lines of text, which have been identified as part of a discourse on wild animals by an early Jewish convert to Islam, Kab al-Ahbar (fig. 59). The presence of this text suggests that the drawing comes from an early Islamic book about animals. The style of the drawing, however, suggests a twelfth-century date, indicating that the drawing comes from a copy of an early text illustrated at a later date. But the reverse of the same sheet bears a drawing of a hare accompanied by a text irrelevant to that on the front of the sheet, so it is difficult—indeed impossible—to imagine how this page could once have formed part of a book. Another painting purports to be the frontispiece to a collection of poems by a well-known Umayyad poet, but similar historical and technical problems raise doubts about the authenticity of this painting and several other related drawings. It seems best, therefore, to treat all these unauthenticated fragments with extreme caution and not base an argument on them.

Scattered literary references to illustrated manuscripts suggest that they did exist but were rare, for medieval authors noted such manuscripts precisely because they were unusual and had pictures. When the historian al-Masudi visited the house of a notable in the Iranian city of Istakhr (near modern Shiraz) in 915, he reported that he was shown a manuscript about the Sasanian kings and their achievements. This luxury manuscript, a copy of which had also been sent to the Umayyad caliph Hisham, had supposedly been compiled two centuries earlier from sources found in the old Sasanian royal library. Embellished with twenty-seven “lifelike” portraits of rulers—twenty-five kings and two queens—painted with gold, silver, and ground copper, the manuscript had been copied on leaves of parchment tinted purple, a clear reference to Byzantine imperial manuscripts and an indication of its singularity.

At a more mundane level, al-Nadim indicates that his Fihrist was meant to be illustrated with images to clarify the meaning of the text, much the way a sci-
entific book is illustrated with diagrams. Where he wrote, "It is said that this is the form of the idol that is at Multan [in India]," several copies of the text have a blank space intended for an illustration. One manuscript of the *Fihrist,* once owned by the Mamluk historian al-Maqrizi, is illustrated with purported specimens of ancient scripts discussed by the author. Similarly, according to a twelfth-century account, Mansur al-Suri, who wrote a book on botany, commissioned a painter to accompany him on his field trips and paint plants in color at the different stages of their growth; none of this work is known to survive.

Manuscripts of the book of animal fables known as *Kalila and Dimna* may have been illustrated from pre-Islamic times, but even if so, we should not assume that other texts were regularly illustrated in the first centuries of Islam. The *Kalila and Dimna* tales, which derive from the Indian *Pañcatantra,* a mirror for princes written around the year 300, were first translated into Arabic from a Middle Persian version by Ibn al-Muqaffa in the eighth century. The earliest extant Arabic manuscripts do not date from before the early thirteenth century, so there is no direct evidence that earlier manuscripts were illustrated. According to Ibn al-Muqaffa’s introduction, however, “He who peruses this book should know that its intention is fourfold. Firstly, it was put into the mouths of dumb animals so that light-hearted youths might flock to read it and so that their hearts would be captivated by the rare ruses of the animals. Secondly, it was intended to show the images of the animals in varieties of paints and colors, so as to delight the hearts of princes and increase their pleasure, and also the degree of care which they would bestow on the work. Thirdly, it was intended that the book be such that both kings and common folk should not cease to acquire it; that it might be repeatedly copied and re-created in the course of time, thus giving work to the painter and the copyst. The fourth purpose of the work concerns the philosophers in particular.” From this passage it would seem obvious that the book was always intended to be illustrated (unless the passage is to be understood metaphorically), but the matter is not quite so simple. Ibn al-Muqaffa’s text was repeatedly edited in later times, so there is some question about whether this passage belongs to his original edition or was added to justify the inclusion of illustrations in a later edition. Although this question remains a matter for specialists to debate, the tales do seem to have been unusually popular in the Middle Ages, for medieval Hebrew, Latin, and New Persian translations are also known.

A fragment of an illustrated Greek version of *Kalila and Dimna* copied on parchment, which has been attributed to southern Italy between 980 and 1050, bears similarities to the illustrations in later Arabic and Persian manuscripts of the text (fig. 60). These similarities have led scholars to suggest that all the extant illustrated versions descend from a common, but lost, Arabic
manuscript source dating as early as the tenth century and ultimately related, like the stories themselves, to Central Asian and Indian prototypes. Such hypotheses aside, this hypothetical illustrated *Kalila and Dimna* manuscript seems to be the exception to the general observation that illustrated manuscripts were rare in the first centuries of Islam.

In imagining the early history of the illustrated book in the Islamic lands, scholars have also tried to incorporate the evidence of images found on other fragments of paper, most of which were found in Fustat and are convention-
ally dated between the tenth and twelfth centuries. Many of the drawings and paintings that cannot be specifically identified as coming from books have been taken to be preparatory studies for painters working on manuscripts or even on pottery, ivory boxes, glass vessels, wooden panels, and the like. Other drawings are thought to have been designs for the textile weaver or embroiderer, the bookbinder or metalworker. Yet there is no evidence at all that muralists, potters, metalworkers, glassblowers, or most weavers worked from designs on paper at this time, so the purpose of the drawings, as well as their date, remains unclear.

Potters in ninth-century Iraq or eleventh-century Egypt would have learned to draw on ceramics by practicing not with ink on paper—paper was too expensive to use and throw away—but with a brush on unfired ceramics or some other available surface. They would have stored their artistic repertoire in their memory, not in pattern books, and maintained it in their muscles. Occasionally, we find a drawing on the back of a tile, which demonstrates that potters practiced a drawing on disposable or concealed surfaces (fig. 61). The vast majority of their sketches, therefore, would have been either painted over or thrown out, leaving little or no indication of how the artist had proceeded to make the finished product.

The freshness of representation and execution in most media of early Islamic art, whether ceramics, metal, or textiles, is further evidence for the use of a direct technique (fig. 62). Had potters or metalworkers copied images from another medium, such as paper, instead of drawing or working directly on their medium itself, the resultant drawings would have lacked their charac-

FIG. 63. Plate inscribed "He who professes faith will excel, and to whatever you accustom yourself, you will grow accustomed. Blessing to the owner." North-eastern Iran or Transoxiana, 10th century. The Freer Gallery of Art, Smithsonian Institution, Washington, D.C. [F1932.11]
teristic energy and individuality. In Islamic ceramics of this period, no two pots are exactly—or even nearly—alike, and the drawings are not rehearsed but are fresh and quite independent of representations in any other medium. In short, the men who painted ceramics did not make—or probably even look at—designs appropriate for, say, metalware or carved wood.

There is a significant exception: a group of ceramics attributed to tenth-century northeastern Iran and Transoxiana, particularly the cities of Nishapur and Samarqand, inscribed with Arabic aphorisms in studied, elegant scripts (fig. 63). Unlike the other contemporary pottery attributed to the same region, whose designs were applied directly to the surface, the inscriptions on the plates and bowls were clearly planned in advance so that the calligraphy exactly fits the surface. The inscribed texts are sometimes religious, but for the most part they consist of proverbs of a secular nature, such as "Learning is at first bitter to the taste but in the end sweeter than honey" or "Patience is the key to comfort." One elegant plate, whose inscription reads "Planning before work protects you from regret" has a superfluous letter kaf added as a space filler to show what happens when one doesn’t plan before work, very much like the once ubiquitous PLAN AHEAD signs. As a group, these ceramics show that at least some of the city dwellers were literate enough in Arabic to appreciate having their dinnerware decorated with aphorisms written in elegant script.

The spare and deliberate inscriptions on these ceramics are written in scripts close to those used on parchment manuscripts of the Koran attributed to the ninth century (see fig. 39). The styles are quite different from the broken cursive styles used on contemporary manuscripts, whether of secular or religious texts (see fig. 43). Considering the high status accorded calligraphers and the relatively low status of potters, it is unlikely that calligraphers would have designed to decorate pots or even known how to handle a brush; it is equally improbable that potters were accomplished in the Koranic scripts or knew how to wield a calligrapher’s pen. Rather, we must imagine that calligraphers prepared designs that potters copied onto plates and bowls, much as modern craftworkers in the souks of Isfahan, Cairo, and Marrakesh transfer calligraphers’ designs to ceramics, metalwork, and embroidery. Although the scripts in which the aphorisms are written are comparable to those of Koran manuscripts on parchment, calligraphers probably prepared their designs not on expensive parchment but on paper, now cheaper and already widely used for other types of manuscripts. Several centuries of paper production in the cities of Central Asia and northeastern Iran made it likely that artisans serving the wealthy urban population who were able to afford fine wares were among the first to explore the artistic possibilities of this new medium.

Paper may also have been involved in the design and production of luxury
Fig. 64. Linen textile with inscription band tapestry-woven in silk mentioning the name of the Fatimid caliph al-Zahir. Egypt, 1021–36. Royal Ontario Museum, Toronto [973.424.8b]

textiles, which played an important economic role in medieval Islamic times, but our knowledge about how weavers worked then is based largely on extrapolation from surviving fragments, and these may not necessarily be representative. For most plain fabrics (and those with simple geometric patterns, like stripes and checks), which were the bulk of the textiles produced, weavers had no need of pictorial instructions. Tapestry weavers adding decorative bands may have used drawings under their looms to guide them when inserting colored threads to make their patterns, but the largely repetitive nature of most tapestry designs in this period—bands of small roundels containing geometric, plant, or animal motifs—suggests that all but novices could have produced many of the typical designs from memory or by using a woven sample as a model.

Cartoons on a material like paper, however, were probably required to produce those Islamic textiles inscribed with texts naming the ruler and indicating that they were made on his order. These tiraz textiles, produced from early Islamic times in Central Asia, Iraq, and Egypt, were an important sign of sovereignty, because the ruler seasonally gave lengths of the fabrics to courtiers, who had them made up into garments. The formulaic texts were either woven into the fabric using the tapestry technique or embroidered onto the finished fabric, depending on what was usual in the state or private workshop where the fabric was made (fig. 64). A court official prepared the texts, which were then copied into or onto the textile by the weavers or embroiderers, who were presumably illiterate—or so we can judge from the mistakes they often made. Although we can imagine weavers producing geometric, plant, and animal patterns in the borders from memory, the difficulty of inscriptions and their willful complexity point to the need for court officials to have used some portable medium to provide them with correct texts. This medium was probably paper in Central Asia and Iraq, papyrus in Egypt until the ninth century, and, possibly, parchment in North Africa.
Diagrams on paper or a similar medium were also needed to prepare drawlooms to weave luxury silks, which became increasingly popular in the Islamic lands from the tenth century. As we have seen, the older techniques of tapestry weaving and embroidery are dependent on the artisans' decisions as they work. If weavers find that threads are thicker or thinner than usual, they can adjust the pattern as they go along, and embroiderers can choose to create flowers, say, instead of birds. In contrast, with drawloom weaving, which was invented in China and brought to Islamic lands, the pattern has to be prepared in advance and entered on the loom prior to weaving, much the way a program must be installed on a modern computer before we can do anything useful. Entering the pattern on the loom consists of tying cords to each warp (lengthwise) thread; the cords are gathered in bundles, collectively known as a simple, which are pulled in a predetermined order, thereby regulating the pattern to be woven. In itself, the simple does not reveal how the finished textile will look, just as the program files on a computer do not show what a program will do. Once the pattern has been entered on the loom, the weaver and the weaver’s assistant, or drawboy, can start weaving. The drawboy select bundles of threads in sequence, thereby raising and lowering the pattern warps, and the weaver inserts the wefts (crosswise threads) to make the cloth. As long as the weaver and the drawboy follow the instructions encoded in the bundles of cords, the designer’s pattern will be reproduced in the weave, and very little is left to the weaver’s volition.

We have no direct knowledge of how medieval Islamic weavers encoded their patterns, but analogies can be drawn from eighteenth-century France or even twentieth-century Iran, where similar results were obtained. The design for the finished textile is transferred to graph paper, each square representing a single warp step. The graph is transferred to the simple; now each square of the graph represents one tied warp thread. For fine silks, which might have 150 warps per inch (60 per centimeter), entering the pattern into the loom could take as little as a month or as long as a year, and the weaving could progress from half an inch to a yard per day (a centimeter to a meter), depending on the fineness of the pattern and the number of colors used. Given the demands of the technique, designers of drawloom textiles must have drawn preparatory gridded designs, because weavers could not have retained such complexity entirely in memory. No gridded designs for medieval textiles are known to have survived, but the use of grids in other contexts is first suggested by descriptions of Islamic maps from the early tenth century. In addition, we know that a system existed for notating the patterns used on medieval textiles—presumably a grid—because we have examples of complex textiles woven to identical patterns with different materials on different looms.
The complexity of drawloom weaving explains why this elaborate technique was used only for the finest silk textiles, such as the Shroud of Saint-Josse, which was woven in seven colors (plum, yellow, ivory, sky blue, light brown, copper, and golden brown) on red warps with a design of facing elephants with dragons between their feet, the whole surrounded by a train of Bactrian camels (fig. 65). An inscription in Arabic gives the name and titles of a Turkish commander active in northeastern Iran who was executed on the orders of his Samanid sovereign in 961. Because the commander must have been alive when the piece was made, it must have been woven in Khurasan or Transoxiana in the mid-tenth century. It is inconceivable that this splendid textile was prepared without a preliminary drawing to set up the loom, and it is likely, given the place and date of production, that the drawing was made on paper. Complex silks had, of course, been woven on drawlooms in pre-Islamic Byzantium and Sasanian Iran, where paper was not yet available, so the designs were undoubtedly prepared on some other writing surface, presumably parchment, whose expense would have been offset easily by the high cost of the finished goods. Paper was not, therefore, strictly necessary for the planning of drawloom silks, but it facilitated artistic creation and innovation.

Most scholars have assumed that builders in the medieval Islamic lands used plans and that once paper was available, these plans were drawn on paper. But no such plans have survived from the early medieval period, and the assumption is probably unwarranted. As in medieval Europe, architectural
practice in the medieval Islamic lands was essentially traditional, empirical, and experimental, and it remained so until modern times, if the anecdote with which this chapter opened is indicative. With few exceptions, builders did not use plans—because they did not need them. Like potters and metalworkers, builders learned from other builders, using memory and gesture to preserve and transmit their plans and designs, as well as to estimate costs and quantities.

Close scrutiny of some exceptional buildings, such as the Dome of the Rock in Jerusalem, which was ordered by the Umayyad caliph Abd al-Malik in 692, admits the possibility that the designer used some graphic aids in setting out an extremely sophisticated plan, but the evidence is far from conclusive, and even here the complex plan may have been drawn out on the site. In any case, to generalize from an exceptional building like the Dome of the Rock could well be misleading, because most other early Islamic structures were far simpler in design and construction.

During the first five centuries of Islam most builders worked entirely without graphic representations, as when erecting the most popular type of mosque—a hypostyle structure, consisting of many columns or piers holding up arches that support vaults or a flat or gabled wooden roof (fig. 66). Hypostyle mosques could be large or small, but the repetitive nature of this type of structure meant that, as in medieval European churches with repeated bays, the first element erected—whether a column, arch, or vault—served as a full-scale model for erecting subsequent elements. Adjustments were easy but
were also necessary to make, particularly since building materials did not come in standard sizes. Builders adjusted and fit all elements into place on site; plans were of limited value. At the Great Mosque of Tunis, built in the ninth century, the realization of the plan was so askew that none of the angles is even close to right, although this is hardly apparent to the casual observer; many modern plans of the site—even those prepared by qualified drafters—have missed this feature entirely.

Furthermore, most buildings, whether in the Islamic lands, Byzantium, or western Europe, were overbuilt. Buildings were usually far stronger than modern engineers calculate they needed to be, and this was in order to absorb any mistakes made in planning or estimation. It was far wiser, for both builders and clients, to be on the safe side and overbuild. Just as carpenters today know without calculation or reference to manuals what the acceptable span for a wooden beam is, or the appropriate pitch for a roof in a snowy climate, most builders in the medieval Islamic lands knew how to make buildings stand up without recourse to preliminary drawing.

That said sometimes people made drawings of buildings or parts of buildings. Scholars have collected scattered references to plans in early Arabic texts and concluded that plans were widely used, but whatever these plans may have been, they were not very sophisticated, nor were they systematic representations of architectural space. Contemporary geographers had far greater experience of mathematical theory and a far more pressing need to use graphic representation than did the practitioners of the wholly empirical practice of building. Yet even the most sophisticated geographical representations were still remarkably crude, or so we can judge from the surviving examples (see, e.g., fig. 52). It is not likely that builders were more sophisticated than geographers.

Builders may occasionally have made drawings or models to work out a particular detail or to convince a patron to spend money on a building, but most builders did not draw at all, and in any case, few patrons would have been able to read a drawing. Literate people today tend to forget that the ability to conceptualize and represent three-dimensional spaces on two-dimensional surfaces (and decode these representations) is an extremely sophisticated skill, one that has been honed in the West since the Renaissance. There is no evidence that medieval Islamic builders, much less ordinary or even exalted folk, were able to think of buildings and spaces in this way.

Some idea of how people thought about buildings is provided by what was written about them, but there are few such medieval Islamic texts. Not many of the people who wrote books, it would seem, thought much about architecture. The existing discussions of buildings are usually so obscure as to suggest that their authors were grappling to find an appropriate vocabulary with which to express
their observations. Here is how the tenth-century historian al-Masudi, who is normally extremely clear, describes a palace erected in ninth-century Iraq:

And in his day [the caliph] al-Mutawakkil created a building in a style that the people had not known, and it was the one known as "the hiri and two sleeves and porticoes." One of his companions in nightly entertainment related to him one night that a king of al-Hira of the Numaniya [branch] of the Bani Nasr [family] created a building in his permanent residence, that is, in al-Hira, in the image of war and its form, because of his fascination with war and his leaning toward it, so that it would not slip from his memory as long as he lived. And the portico had in it the seat of the king, which is the chest, and the two sleeves to the right and left. And in the two bayts, which are the pair of sleeves, were those of his attendants who were close to him. And in the right one was the wardrobe store and in the left, what he needed of drink. And the portico's enclosure encompassed the chest, the two sleeves, and the three doors to the portico. And this construction has been called to this day "the hiri and the two sleeves," referring to al-Hira. And the people followed al-Mutawakkil's lead in this example, and it became famous thereafter.

Modern architectural historians have pondered over this text. Had al-Masudi known how to describe buildings as a succession of spaces or how to depict them graphically, he undoubtedly would have done so.

Another example is provided by an inscription on the Great Mosque of Taza, Morocco, which states that the thirteenth-century Marinid sultan Abu Yaqub Yusuf expanded the mosque by four balat—the word is normally understood to mean a bay or an area enclosed under a single rectangular vault or roof. Examination of the mosque shows that the sultan actually extended each of the nine aisles, which run perpendicular to the qibla wall, by four units. As we can deduce from the inscription, the contemporary audience was concerned only about the depth of the extension and not about the number of aisles or the direction in which they ran; both of these features are far more important when displayed on a two-dimensional plan than when viewed from inside the mosque.

Like the mason mentioned in the epigraph to this chapter, medieval builders did not need paper to teach them how to use materials and exploit their decorative potential. Masons simply manipulated the spaces between bricks and the way the bricks were laid to create patterns of light and shade, as we can see in the web of brick patterns enveloping the mausoleum erected for
the Samanid family in Bukhara (fig. 67). Although paper was certainly available and used in early tenth-century Bukhara, the builder had no need to draw the geometric patterns that he proposed to use; rather, the ability to make such patterns was an expected part of the builder’s repertoire, learned from masters and remembered.

In contrast to those who made and decorated buildings, philosophers and mathematicians, seeing what builders and decorators had done with practical geometry through empirical knowledge, developed models to explain and reproduce the results. There is little, if any, indication, however, that artisans thought or worked in such ways, or that they communicated with the intellectuals. Modern scholars have interpreted several treatises by such thinkers as the extraordinarily curious and prolific polymath Abu’l-Wafa al-Buzjani and the tenth-century philosopher al-Farabi as evidence that medieval architectural practice had a theoretical basis. These works, however, attest more to the intellectual curiosity of the age than to the systematic practice of any art. Similarly, contemporary manuals of calligraphy are not how-to books but treatises written to fit scripts into authors’ theories. As in mathematics, there was a great difference between the theoretical subjects about which the cultivated urban elites wrote and the empirical practices of those who got their hands dirty.

The idea of learning how to do something by reading about it in a book is distinctly modern. The medieval treatises that survive are not manuals but
attempts by intellectuals to give order to what seemed to them to be the chaotic and disorderly practices of artisans. It seems hardly likely that a work such as Abu’l-Wafa’s *Book of the Things That Writers and Secretaries Need to Know About Arithmetic*, which is in any case known only from much later Arabic and Persian copies, was intended as a medieval version of *Popular Mechanics or Fine Homebuilding*, for medieval builders learned by following the example of their masters, not by reading instructions. Even if artisans could read the Koran or recognize the words in religious inscriptions whose text they already knew by heart, it is doubtful that they were sufficiently literate to read a book on geometrical constructions. Such books should be understood, therefore, in the context of the literary genre known in Arabic as *adab*, belles lettres dealing with knowledge of the nature and passions of human beings and their environment and material and spiritual culture, a subject of great importance in the Abbasid period. We can conclude that although paper was increasingly available to several segments of society from the ninth century, there is little evidence that architects and other artisans were fully alive to its extraordinary potential until three or four centuries later.

**FROM THE THIRTEENTH CENTURY**

Paper played a larger role in the arts in many of the Islamic lands toward the end of the twelfth century. Apart from a sudden increase in illustrated manuscripts, there is also evidence that artisans in other media used designs on paper for reference or for transfer to another medium, and evidence, too, that builders used paper for architectural plans. Unlike earlier drawings, those from this period had a clear purpose: they can easily be identified as preliminary sketches for more finished works.

But the principal evidence for the increased use of paper concerns books with paintings. Illustrated books burst on the scene in Iraq and Iran during the late twelfth and early thirteenth centuries, when new and different types of books were illustrated, apparently for the first time. In addition to scientific and technical treatises, which had long been illustrated with diagrams and maps, books of poetry and belles lettres now appear with frontispieces and with pictures in the text. But where scientific and technical illustrations had made the accompanying texts intelligible, the new pictures were quite unnecessary for understanding the text. Something new was going on.

Scholars have proposed various explanations for this phenomenon. Some, using pictorial evidence from the other arts, have argued that manuscripts had long been illustrated in the Islamic lands, but as we have seen, little direct evidence supports this hypothesis. Others have traced the explosion of illustrated books to external influences—perhaps, for example, artists in the Islamic
lands copied Middle Byzantine or Syrian Jacobite painting—and still others have proposed the appearance of illustrated manuscripts as the result of an internal development within the Islamic lands, specifically the emergence of the bourgeoisie as patrons of this new art form. All of these explanations may be partly true, but they deal with the problem in a rather narrow way. From the broader perspective of the history of paper, it seems obvious that the illustrated book emerged as a major art form just at the time when larger sheets of fine-quality paper became increasingly available.

Northern and central Mesopotamia, the heartland of the old Abbasid caliphate, became the major centers of book illustration in the twelfth and thirteenth centuries. By the early fourteenth century, the center of innovation had shifted to northwestern Iran under the patronage of the Ilkhanids, and the art of the illustrated book remained a speciality of Iran, from which it eventually spread to the Ottoman empire and Mughal (Mogul) India. The Mamluks of Egypt and Syria seem to have been less interested in illustrated books, although a few such manuscripts were produced in either Cairo or Damascus. Only one illustrated manuscript, the romance of the lovers Bayad and Riyad, has survived from Islamic Spain, so it is difficult to generalize about the development of the illustrated book there (see fig. 36). Nevertheless, as the illustrations to this manuscript, which was copied on paper in the thirteenth century, clearly depend on Mesopotamian models, Spain may have enjoyed a parallel flowering of illustrated books from the thirteenth century.

Many of the texts chosen for illustration continued to be scientific and technical works, such as books on astronomy, pharmacology, mechanics, farriery, and the *Kalila and Dimna* animal fables. New works chosen for illustration included the *Book of Songs*, a twenty-volume collection of early Islamic poetry by the tenth-century anthologist Abu’l-Faraj al-Isfahani. A copy of the text was prepared for Badr al-Din Lulu, regent of Mosul in northern Mesopotamia in the early thirteenth century. Although the poems themselves are not illustrated, each volume has a dedicatory frontispiece showing the ruler engaged in a princely activity (fig. 68). These images have been linked to the classical tradition of frontispieces depicting the author or patron of a particular book, but their sudden appearance at this time demands some other explanation. The most likely one is that artists were beginning to realize the potential offered by paper. We know that several other poetical works were illustrated in a similar manner. The historian al-Ravandi mentions in his history of the Saljuqs, composed in 1202, that in 1184–85 the sultan Tughril III asked al-Ravandi’s uncle to compile and transcribe an anthology of poems; when it was completed, the painter Jamal of Isfahan illustrated the volume with depictions of the poets cited.
FIG. 68. "Badr al-Din Lu’lu’ hunting with falcons," frontispiece to Book of Songs, volume 20. Mosul, 1219. Det Kongelige Bibliotek, Copenhagen [Cod. arab. 158 fol. 1r]
Other poetical works contained depictions of events described in the text. An undated manuscript of Ayyuqi’s Persian verse romance, *Warqa and Gulshah*, is the earliest illustrated text in the Persian language to survive (fig. 69). The small manuscript has seventy-one striplike illustrations with small haloed figures. Scholars initially thought that the stylistic similarities between the illustrations and dated Iranian lusterware meant that the manuscript had been copied in Iran in the late twelfth century, but the painter’s name, Abd al-Mumin ibn Muhammad al-Khuvayyi (which indicates that he came from Khoj, in northwestern Iran), also appears on the 1253 endowment deed of the Karatay madrasa in Konya, Turkey. It now seems more likely that the manuscript was copied and illustrated in central Anatolia in the mid-thirteenth century.

One of the favorite texts to be illustrated in the period was the *Magamat* (Assemblies), composed around 1000 by the Iranian al-Hamadhani but popularized in the version written maybe a century later by the Iraqi al-Hariri. Eleven illustrated copies of the text, a series of fifty picaresque tales set in different parts of the Muslim world, have survived from before 1350. Each recounts the adventures of the rogue Abu Zayd of Saruj as told to the merchant al-Harith. By overwhelming people with his eloquence and erudition, Abu Zayd gets them to reward him with money. The subject of the tales is not the rogue’s adventures but the author’s verbal pyrotechnics. The illustrated man-

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_Fig. 69. “Warqa’s father, Humam, dies in his arms.” from Warqa and Gulshah. Konya, mid-13th century. Topkapı Palace Library, Istanbul, H 841, fol. 16b_
uscripts, however, emphasize an almost gratuitous aspect of the text: the varied settings of Abu Zayd’s adventures. The most famous copy of the text, transcribed and illustrated with ninety-nine pictures by Yahya al-Wasiti in Baghdad in 1237, has particularly inventive and detailed illustrations (see fig. 48). Nevertheless, the colophon mentions no patron, so it, like most other manuscripts of the text, was probably made for sale on the market to a well-educated and well-heeled buyer.

Even historical chronicles began to be illustrated in the late twelfth century, although no examples have survived. The illustrator of Rashid al-Din’s *Compendium of Chronicles*, a multivolume universal history copied in Tabriz, in northwest Iran, in the 1310s, based many of his images on those found in earlier manuscripts. Because of the number and consistency of his images dealing with the Ghaznavid and Saljuq dynasties, he must have been copying now-lost illustrated histories of those dynasties. The manuscripts that he copied, and his own, had striplike illustrations scattered throughout, depicting the major battles and enthronements of the Turkish rulers. The illustrations would have been pretty but gratuitous additions to the text.

Illustrated books were not just growing in number and type; they were also increasing in size. Indeed, books of all kinds were being produced in larger formats; with improvement in papermaking techniques, paper in larger sizes became more widely available. The earliest known books with illustrations were very small, measuring only 6 by 3 inches (16 by 7 centimeters), or about one-quarter the size of a sheet of modern business paper. The manuscript of al-Sufi’s *Treatise on the Fixed Stars*, dated 1009, measures 10 by 7 inches (27 by 18 centimeters; see fig. 51), and the pages of the *Book of Songs* made at Mosul in the early thirteenth century measure 12 by 8½ inches (31 by 22 centimeters; see fig. 68), just a bit larger than a sheet of modern business paper. The celebrated copy of al-Hariri’s *Maqamat*, made in Baghdad in 1237, is on even larger pages (13½ by 11 inches; 37 by 28 centimeters; see fig. 48), although the contemporary copy of the same text in St. Petersburg is half the size (10 by 7½ inches; 25 by 19 centimeters). The pages in the early fourteenth-century copies of Rashid al-Din’s *Compendium of Chronicles* were folded from sheets measuring some 20 by 28 inches (50 by 72 centimeters; see fig. 29), and even larger sheets were used to prepare the Great Mongol *Shahnama*, probably made in Tabriz around 1335 (see fig. 30). By the fifteenth century designers and calligraphers seem to have placed less emphasis on the sheer size of books, preferring to emphasize the qualities of the paper itself and the calligraphy, illumination, and illustration. Nevertheless, particularly important manuscripts, such as royal copies of the *Shahnama* and Timur’s mammoth manuscript of the Koran, were often made on unusually large sheets of paper.
Small manuscripts must always have remained more common than those of imperial scale because large sheets of paper were always more difficult to make (and therefore more expensive). There are, for example, three fine but small manuscripts of the Shahnama, known collectively as the Small Shahnames, which were produced, at a guess, in Iraq or Iran in the late thirteenth or early fourteenth century (fig. 70). Although each manuscript is lavishly illustrated with more than one hundred illustrations spread over three hundred folios, the written surface of the largest measures only 10\(\frac{1}{2}\) by 7 inches (25 by 18 centimeters), less than half the size of the Great Mongol Shahnama. That these
manuscripts are so consistent in size and scale also shows that they were products of commercial workshops, where ample supplies of good paper in standard sizes were readily available.

That more paper and larger sheets of it were available in the Mongol domains during the late thirteenth and fourteenth centuries placed this region at the forefront of artistic innovation in several respects. First, bigger books allowed artists to design larger and more complicated illustrations than had been previously attempted. The tiny sheets of the earliest illustrated book could not have afforded even the most talented artist much room to display his abilities. The unusually large pages of the 1237 copy of al-Hariri’s *Maqamat*, probably made in Baghdad, offered the artist, al-Wasiti, generous spaces in which to create his unusually inventive and expressive compositions, but most contemporary books, especially ones produced in the provinces, where paper supplies were limited, must have been smaller, with space only for narrow striplike illustrations. The seventy-one illustrations in the *Warqa and Gulshah* manuscript measure only 2 to 3 inches (5 to 7 centimeters) high; even the most talented miniaturist would have little scope to show detail and setting. The larger format of Rashid al-Din’s *Compendium of Chronicles*, dating from a half-century later, provided the illustrator with a larger surface on which to work, although most of the illustrations retain the striplike format of earlier manuscripts. The Rashid al-Din illustrations, which are typically 4–5 inches (10–12 centimeters) high, are more complex and detailed than earlier illustrations, for the doubling in height and width gave quadruple the area for complicated scenes and details of dress, landscape, and setting. As we might expect, the images in the contemporary Small *Shahnamas* retain the miniature scale of the *Warqa and Gulshah* illustrations.

The culmination of the trend toward larger illustrations on larger pages is the Great Mongol *Shahnama*. Its pages provided the most generous opportunities to date for introducing both spatial and psychological complexity into the picture space (see fig. 30). The images are as much as 8–10 inches (20–25 centimeters) high, and the finest are monumental in conception, in a mode quite at odds with traditional notions of Persian miniature painting. Other illustrations attributed to the same period, detached from manuscripts centuries ago and collected in albums (now in Berlin and Istanbul), are of a comparably generous size, indicating that the Great Mongol *Shahnama* was just one of many large-format manuscripts produced at the time. By the end of the fourteenth century, however, the taste for expansive compositions in early Persian book painting had given way to a preference for an exquisite miniature style in which composite vignettes and episodic lyricism replaced strong composition and emotional drama.
In a parallel development, illuminators began to take advantage of the expanded format of Koran manuscripts to decorate the opening pages with extraordinarily complex geometrical patterns. Pages at the beginning and end of a text decorated with geometric interlaces and arabesques had been popular additions to manuscripts of the Koran since earliest times, but the complexity of the compositions was limited by the relatively small size of the page and often by the reluctance of the designer to use all the space available. In the thirteenth and fourteenth centuries illuminators exploited the bigger pages, as well as the smoother surface of the available paper, to create designs of unparalleled complexity, detail, and elegance (see fig. 78). Thus it was not simply a matter of more and cheaper paper creating the conditions for the art of the book, although these were key factors. Larger and higher-quality sheets of paper were also a precondition for major changes in style and composition.

A second way in which the use of paper had an effect on the arts was that artisans of all types began drawing on paper, making it an important stage in artistic creation. The albums in Berlin and Istanbul also preserve ink drawings dated to the fourteenth century that were certainly preparatory sketches for some other work (fig. 71). Some of them must have been preserved in artists’ or studio portfolios to maintain and transmit successful designs and compositions once a completed manuscript had been sent from the workshop to the patron’s library. Other drawings may have been used to prepare designs for transfer to other media, such as ceramics or metalwork.

Preliminary drawings had already been used in the early thirteenth century, as we can see by charting the development of Iranian lusterware. The luster ceramic tiles and vessels, which often bear precise dates, display a variety of
styles. Scholars initially associated the different styles with different centers of production, such as Rayy and Kashan, but more recent scholarship has shown that luster potting was a monopoly of the city of Kashan, in central Iran, and that all the styles were produced there. The earliest style of decoration is the "monumental" style, in which large-scale motifs were painted directly on the surface and kept in reserve against a luster ground—that is, the "subject" is left white, with a few details drawn in luster, while the background is painted (fig. 72). Dated to the twelfth century, this style bears many similarities to the type of painting found on Egyptian lusterware from about a century earlier, and it may have been introduced to Iran by immigrant Egyptian potters. In the second, "miniature" style, the ceramic surface was divided into panels or bands, and the designs were drawn on the glaze much as if the luster paint were a form of ink (fig. 73). In the third, "Kashan" style, figures are reserved against the ground as in the monumental style but are drawn as in the miniature style. In the Kashan style both figure and ground, however, are decorated with painted and scratched (reserved) spirals and surrounded by similarly decorated inscription bands (fig. 74).

The differently styled ceramics are usually explained as the products of different workshops or as the result of changes over time, but they also reveal that painters were using paper designs in the preparation of their work. The monumental style comes out of the traditional method of painting directly on
Fig. 73. Luster-painted bowl. Kashan, March 1191. Glazed fritware, diam. 15 in. (38 cm). The Art Institute of Chicago, Logan-Patten-Ryerson Collection [1927.449].

Fig. 74. Luster-painted dish. Kashan, 1207. Glazed fritware, diam. 15½ in. (39 cm). Victoria and Albert Museum, London [C51-1952].
the ceramic surface, whereas the miniature style, which has often been compared to contemporary manuscript painting, such as the Warqa and Gulshah illustrations (see fig. 69), shows that some painters were adopting for the ceramic surface techniques developed for drawing on paper. The Kashan style, which best displays the luster technique, is the work of master decorators who were comfortable not only with the ceramic techniques of reserve painting but also with the fluid drawing and calligraphy more suited to working on paper.

These master decorators of Kashan, unlike potters elsewhere, had high status. Earlier potters had occasionally signed their work with a name and perhaps a father’s name (as in the case of the Egyptian luster potter Muslim ibn Dahhan), but some of these Kashan potters traced their lineages over several generations. They rose to positions of importance in the arts, as well as in government and religion, particularly under the Ilkhanids. One of the best known families of potters descended from one Abu Tahir, who must have lived around 1200. His grandson Ali ibn Muhammad ibn Abi Tahir was active in the middle of the thirteenth century, for he signed several luster mihrabs between 1242 and 1265. Ali’s son Yusuf signed major luster mihrabs between 1305 and 1334.

Ali’s sons—Yusuf’s brothers—chose to enter other professions. One, Izz al-Din Mahmud, became a mystic in the ulema, or religious establishment—specifically, at the Suhrawardy Sufi hospice in Natanz. Another, Jamal al-Din Abu’l-Qasim Abdallah, became a scribe and accountant in the Ilkhanid bureaucracy. This second brother, Abu’l-Qasim, wrote a biography of the sultan, as well as a treatise on gems and minerals, a section of which remains the major literary source on the art of making ceramics in medieval Iran. Abu’l-Qasim’s treatise, unlike earlier theoretical manuals—which show little familiarity with how things were actually done—is based on a firsthand knowledge of pottery, learned from his family. Clearly, by the early fourteenth century a new type of artisan had emerged in Iran who was able to move easily between the hands-on practice of ceramics and the text-based literary culture traditionally associated with the bureaucracy and the ulema.

At the same time, just when paper use was spreading, the quality of painting on Kashan ceramics declined. A century earlier the drawing on Kashan ceramics had represented the finest drafting skill in Iran; by the fourteenth century it had become clumsier and less inventive than in either earlier ceramic decorations or contemporary book illustrations. It is hardly a coincidence that painting on pottery declined as painting in books became more important, improved in quality, and increased in expressiveness. The growing prestige of book painting in the thirteenth and fourteenth centuries, fostered, as we now know, by the increased availability of paper, may have encouraged the
best decorators of pottery to switch to paper. Dust Muhammad, the Safavid librarian and chronicler, looked back on this period as the source of the later Persian tradition of representation. He said that it was in the reign of the Ilkhanid Abu Said (r. 1317–35) that a certain painter, Master Ahmad Musa, had "lifted the veil from the face of depiction" and invented the style of depiction that was then current.

By the fifteenth century the idea of working from paper drawings was so common that they were regularly used and reused, or so we can infer from the many figures and compositions repeated and reversed in manuscript illustrations. Sometimes artists copied their models by eye, adding subtle changes of line and scale, but sometimes they used mechanical means of transferring designs. A scene of an open-air Mongol court in the Anthology prepared for Iskandar Sultan in 1410–11 appears to be based on an earlier, probably Ilkhanid painting (fig. 75). Close inspection reveals that the artist of the Anthology composition traced the outlines of the drawing following a row of tiny dots, still visible beneath his line. Dust or powdered pigment, called pounce,

**Fig. 75.** "An open-air Mongol court," from an Anthology prepared for Iskandar Sultan. Ink and color on paper. Shiraz, 1410–11. Calouste Gulbenkian Foundation, Lisbon [L. A. 161 fol. 260b]
was rubbed through a pricked design on paper or parchment to create a copy of the original. Pouncing, which is related to stenciling, seems to have originated in China before the tenth century, for pounced drawings were used to mass-produce wall paintings in Dunhuang; Sir Aurel Stein actually found three heavily pounced paper drawings in the Cave of the Thousand Buddhas there. The technique of pouncing was carried across Asia and surfaced in Iran about 1400, although the pricked drawings still extant are of a somewhat later date (fig. 76). The first appearance of pouncing in Europe is in Cennino Cennini’s Libro dell’arte (around 1390), where he recommends using it to replicate complex brocade patterns in paintings. Although it is possible to make stencils and pricked drawings on parchment or skin—and Cennini did so—the dissemination of this technique across western Asia was closely tied to the medium of paper. The similarity of design and scale on several vessels and tiles produced at Iznik in the late fifteenth or early sixteenth century suggests that potters in western Anatolia used pouncing for transferring patterns from paper to the ceramic surface.

The first attempts at establishing a dynastic style may have been made under the Ilkhanids. As early as the fourteenth century, the designs on metalware began to bear strong similarities to designs found in contemporary manuscript illustrations. No intermediary drawings survive, but it is more likely
that metalworkers and book illustrators were working from common design sources than that one was dependent on the other. Similarly, the carved and painted geometric patterns decorating the vaults of sultan Uljaytu's gargantuan mausoleum at Sultaniyā, built in the early fourteenth century (fig. 77), share many features with the geometric frontispieces decorating contemporary manuscripts of the Koran (fig. 78). Unlikely though it may be that Ilkhanid plasterers also worked with pen and ink, the similarities do indicate that, as with metalwork and book illustration, architectural decorators and manuscript illuminators worked from common sources. Although none is known to have survived, these sources must have been drawings on paper that could be read and interpreted by manuscript illuminators, architectural decorators in paint and stucco, and metalworkers alike.

By the fifteenth century the evidence for the use of such drawings is unequivocal, for significant numbers of preparatory drawings from this period have been preserved. In addition, there is clear evidence for the existence of royal design studios. We know that the Timurid prince Baysunghur placed the renowned calligrapher Jafar ibn Ali Tabrizi in charge of his court workshop. In a celebrated letter, the calligrapher wrote to the prince detailing progress on twenty-two projects, including manuscripts, designs, objects, tents, and architectural work. At least twenty-three artists, painters, illuminators, calligraphers, binders, rulers, and chestmakers worked alone and in teams within the royal studio. Unlike earlier times, when craftsmen would have been responsible for reinterpreting what they had seen and remembered, artisans now were charged with reproducing and executing designs created by others. Furthermore, individuals engaged in different crafts worked from the same or similar designs.

The medium of paper not only allowed designs to be conveyed from a designer to an artisan but also served to convey designs from one medium to another. Drafters could abstract a design from one place and apply it in an entirely different setting. The scale, too, might also change dramatically. An artist could, for example, draw a design observed on a Chinese carved lacquer bowl and put the drawing aside in a portfolio or album. A bookbinder or plasterer might come upon the drawing and transfer the design by means of stencil or pounce to another medium, perhaps a molded-leather book cover or a carved and painted plaster panel many times the size of the original lacquer bowl. The bookbinder or plasterer would never have seen the bowl, and the intermediary drafter might have had no inkling that his drawing would be translated into leather or stucco. Designs were divorced from their original contexts, and this free-floating quality of design became a feature of later Islamic art, particularly the art made for the court.
Paper also allowed artists to plan their work in new ways. In the fifteenth and sixteenth centuries, the tile designs on buildings erected by Timurid and Safavid patrons are so often exactly fitted to the space available that the designs must have been worked out first on paper. After artisans in workshops made tiles following the designs, the finished tiles were sent to the sites for installation. In another example, in the fifteenth-century Blue Mosque in Tabriz, an unfinished inscription carved in marble indicates that the engraver must have been working from full-scale drawings.

A third consequence of the increased availability of paper after 1200 was the development of systems of notation that allowed designers to encode specific instructions for later realization. A design for an inscription might be only the outline of the letters drawn on paper at full scale. An architectural plan on paper, on the other hand, is a complex system of representing three-dimensional space at reduced scale on a two-dimensional surface. In spite of occasional statements from rulers and philosophers that plans had been used in earlier times, there is little direct evidence that architects and builders worked with them. Later they did.

The earliest surviving architectural plan from the Islamic lands that was actually meant to help a builder erect a structure is a small plaster plaque found in the ruins of Takht-i Sulayman, the late thirteenth-century Mongol summer capital in Iran. The plaque is inscribed with lines that may have told the work-
Fig. 78. Right-hand frontispiece to the sixth section of a thirty-part Koran manuscript copied at the Rab’-i rashidi in Hamadan for the Ilkhanid sultan Uljaytu. National Library, Cairo [MS 72]
ers how to assemble a muqarnas (stalactite) vault from prefabricated plaster elements (fig. 79). The vault at Takht-i Suleyman has long since collapsed, but at least one other contemporary muqarnas vault—that over the tomb of Abd al-Samad at Natanz—survives to give a good idea of how the pieces would have been put together (fig. 80). The inscribed plaque differs from an architectural plan in that it seems to have functioned merely as a memory aid for artisans who already knew the general principles of constructing such a vault; it was not a complete set of instructions from the planner to the builder. If the excavator's reconstruction based on the diagram is correct, this vault would have been the most complex example of the type in Ilkhanid architecture. Such graphic representations would have been increasingly used in building, and this is confirmed by contemporary texts.
By the second quarter of the fourteenth century, plans, presumably drawn on paper, were drawn up in Tabriz and sent to Yazd for the construction of Rukn al-Din’s funerary complex, which included a madrasa, a hostel for descendants of the Prophet, a hospice for Sufis, a bazaar, and a bath. Because drawing and reading plans is a learned skill, designers in Tabriz must have known that builders in Yazd would know how to decode their renderings on paper and transform them into brick, plaster, and tile. Nevertheless, there is no reason to believe that all builders immediately gave up their traditional practices to erect buildings using paper plans, and this supposition is confirmed by the wide variation in buildings erected during the fourteenth century in Iran.

By the fifteenth century plans and other graphic representations had become more important in architectural practice, although wide differences in the metrology of extant buildings—in their dimensions and proportions—suggest that much construction remained largely empirical. Still, references to paper plans proliferate in this period, and the noted Timurid architect Qivam al-Din Shirazi was reportedly skilled in "engineering, building, and drawing." The oldest architectural drawings on paper to survive can be dated as early as the fifteenth century and include the Topkapi Scroll, a paper roll of drawings for architectural decoration probably compiled in the late fifteenth century in northwestern Iran and preserved in the Topkapi Palace Library. The Topkapi Scroll, however, shows no signs of ever having been used by an actual artisan.

If, as the increasing use of plans suggests, architects and builders developed a language of architectural representation beginning in the fourteenth century, builders, more often than not, must have been able to figure out what the designers intended. Because no elevation drawings for buildings have survived, we do not know whether they would have been used, for builders could have been trained to recognize elevations, or perhaps the essential "skeletal" elements of a building, from plans alone.

With the increased use of plans came a growing uniformity of architecture in the Islamic lands in the fifteenth century and later. Some of this uniformity cannot be ascribed to the increased use of paper plans, it is true. If Mamluk architecture exhibits a certain sameness over the course of the fifteenth century, we can look to the itinerant builders of Cairo, Damascus, and Jerusalem, who were constantly exposed to the buildings that existed as well as those being constructed. The builders and decorators were, in this case, easily able to transmit ideas using the traditional means of memory and gesture. It is much more surprising that contemporary Timurid and Ottoman architecture, which is spread over a much larger geographical area, exhibits stylistic homogeneity. Although teams of builders and decorators did travel from one city to
another in search of work, the impressive uniformity of buildings in both realms in the fifteenth century is not a function of their itinerancy but of a fundamentally new approach to design: professional architects in one place prepared designs for realization in another.

Architectural drawings on squared (graph) paper were used in fifteenth-century Iran—to wit, some plans preserved in Tashkent, apparently dating from the sixteenth century but presumed to reflect fifteenth-century originals, and the gridded drawings in the Topkapi scroll. Certainly, the popularity of expanses of tilework executed in the banan technique—glazed bricks set against unglazed ones to form large-scale patterns and spell out pious names in square Kufic script—suggests preliminary planning on squared paper, with the squares of the grid corresponding to the bricks. Such grids might also have helped builders to estimate the requisite quantities of materials.

Like pricked drawing, squared paper was apparently an invention whose time had come. In the Islamic lands both appear at the same time, following the opening of links with China. In Europe, in contrast, there was a time lag. Returning European merchants and missionaries may have led the Italian Cennino Cennini to prick designs by the late fourteenth century, but the first European architects to use squared paper worked a century later, and even then it was not common. Grids of squares were just one of the systems that architects used. Other proportional systems were based on the diagonal of the square, the equilateral triangle, the semisquare, and the golden rectangle (1:1.618). Whatever the system, it involved drawing and manipulating on paper to generate the designs eventually realized by builders.

As paper plans and drawings in all the arts led to a separation between the designer who planned a work of art and the artisan who executed it, they also led to the emergence of a new aesthetic, in which originality of conception and composition was replaced by a unity of expression and the ability to spin elegant variations on well-known themes. This change was part of a larger one in the eastern Islamic lands, where the taste for artistic originality that had existed under Mongol patronage reverted to a more traditional Iranian taste for the familiar, however revamped. Contemporary Persian literature also celebrated, not novelty of expression, but a poet’s ability to play on forms and themes already in the canon. Artists and architects came to be judged—as calligraphers long continued to be—on their fidelity to their masters’ models, and this fidelity was encouraged by new paper-based techniques of reproduction.

As design became separate from execution, the careers and even personalities of individual architects and artists, consigned formerly to the obscurity of a mythic and anecdotal past, emerged into the bright light of historical fact. For the first time we can delineate careers—of the Timurid architect Qivam al-
Din and the Ottoman master Sinan. Master drafters and painters, such as the incomparable Persian painters Bihzad and Sultan-Muhammad, came into the limelight, too: their works are signed, and their distinct styles are recognized. Conversely, artisans still engaged in such traditional Islamic arts as woodwork, metalwork, and ceramics, who—considering the numerous signatures on their works—had once enjoyed renown, receded into anonymity as their role was reduced; no longer artists in their own right, they merely executed designs prepared by others.

This is not to say that all artists and artisans everywhere in the Islamic lands suddenly began to use paper, for the shift was gradual and affected some regions and some media more than others. Iran remained at the forefront of the arts. In the Maghrib (the Islamic west), an area that had for centuries charted an independent artistic course, the new uses of paper had hardly any effect on the arts. Even within a region, there were differences in the use of paper, for the urban-centered arts of the court were far more likely to involve paper than were the arts of villagers and nomads. Throughout the fifteenth century, Iranian carpet weavers, for example, continued to work by memorizing patterns and counting knots, having no need to use paper cartoons. Although images of carpets and textual references to them indicate that they were highly valued at court, the court did not yet control production, so traditional methods prevailed. Meanwhile, the production of other types of textiles, such as fancy robes embroidered with gold around the collars and cuffs, became dependent on paper patterns, several of which survive from the first half of the fifteenth century.

In the late fifteenth century weavers began to use paper cartoons to produce rugs. For centuries Anatolian weavers had knotted rugs with geometric or geometricized patterns. Some of the earliest to survive are the Konya carpets, now dated to the early fourteenth century, which have a central field with small, angular motifs arranged in staggered rows; the contrasting border is of large pseudo-Kufic designs or stars. Comparable designs produced in the second half of the fifteenth century are known as Holbein carpets; they have a field containing several large octagons inscribed in square frames separated and bordered by bands composed of smaller octagons. The octagons are usually decorated with strapwork patterns, and the several borders of varying width are often decorated with elegant pseudo-Kufic inscriptions with intertwined stems (fig. 81). Despite the apparent complexity of the patterns, which were knotted in brightly colored wool yarns, weavers could produce these carpets from remembered designs or copy them by counting knots.

Ushak medallion carpets, however, another contemporary type of carpet, must have been knotted using paper patterns. Also woven in Anatolia, proba-
Fig. 81. Large-patterned Holbein carpet. Anatolia, late 15th century. Wool pile, 14 x 6 ½ feet (4.29 x 2 m). Staatliche Museen zu Berlin, Preussischer Kulturbesitz, Museum für Islamische Kunst [I. 5526]
bly in or near the town of Ushak, these carpets are similar in technique and color to the Holbein group, but have curvilinear symmetrical designs of arabesques and small tendrils enclosed within enormous ogival medallions (fig. 82). It is believed that Holbein carpets were made for export to Europe, but the enormous Ushak medallion carpets were woven expressly for the Ottoman court, and this difference may explain the dissimilarities of design. But a further difference is that the higher-quality Ushak carpet required a paper pattern for its execution, whereas the lower-quality Holbein one did not.

A minute analysis of the design elements used in Ushak medallion carpets reveals several that are characteristic of other media. It is unlikely that the weavers themselves generated these motifs; rather, the designs incorporating them were prepared in the royal design studio in Istanbul for execution by weavers in Ushak. The weavers would have been supplied with paper cartoons, which they would have flipped and rotated as they worked. As elsewhere in the Islamic lands, the introduction of paper designs and cartoons for royal carpets made in Ushak did not immediately spell an end to traditional Anatolian techniques of weaving and design, but it did serve to differentiate the urban arts of the courts, which used paper, from nomadic and village production, which did not.

The same process that had taken place in fifteenth-century Anatolia took place in sixteenth-century Iran, when the geometric patterns that had characterized earlier carpets were replaced by extremely fine carpets with complex floral and pictorial designs. Whereas the patterns on earlier carpets could have been knotted from memory, the intricate symmetrical designs on royal carpets of the Safavid period must have been worked out on paper long before the loom was prepared, and the weavers themselves must have tied their knots following the instructions encoded in paper cartoons. The weavers were mechanics, in other words, not artists, and in some respects, the change in role flattened the aesthetic landscape.

To make the matched pair of enormous carpets (34 1/2 by 17 1/4 feet; 10.5 by 5.35 meters) made for the Safavid shrine in Ardabil in 1539–40 all the weavers must have worked either from two identical paper cartoons or reused the cartoon once the first carpet was finished. Both carpets are signed as the work of "the servant of the court, Maqsud of Kashan," who must have been not the actual weaver, who with his assistants tied several million knots, but the designer or supervisor of the project. Similarly, one Ghiyath al-Din Jami signed the huge Safavid throne carpet in 1542–43, a carpet decorated with lively hunting scenes. The design sources can also be recognized in contemporary manuscript illustration. Although these extraordinarily cerebral carpets are unquestionably among the greatest examples of the art, they carry a distinctly different aesthetic message than do cruder—but perhaps equally beauti-
FIG. 82. Ushak medallion carpet. Wool pile, length 23 3/4 feet (7.27 m). The al-Sabah Collection, Dar al-Athar al-Islamiyyah, Kuwait [LNS 268]
ful—carpets woven from memory. As in Anatolia, only the finest court-sponsored carpets were woven in this way; Iranian nomads and villagers continued to work in the traditional manner well into the nineteenth and twentieth centuries, when European demand for room-sized rugs in standard and often complex patterns made paper cartoons a necessity.

Although we know very little about the people who made carpets or textiles or any of the other crafts in premodern times, the difference between making things from memory and working from drawn patterns may also have had something to do with gender. Until recently, nomad and village women were responsible for the production of textiles used in daily life, whereas men in city factories usually made the higher-status and more expensive textiles. Because the use of paper patterns before modern times is associated exclusively with the more expensive and high-status textiles, such as tapestry, embroidered tiraz, drawloom silks, and fine large carpets with curvilinear designs, visual literacy, much like verbal literacy, was, it seems, predominantly—though not exclusively—associated with men.