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61. Vatican City, Biblioteca Apostolica, Urb. Lat. 1384; see Angelo Michele Piemontese, ‘Il corano latino,’ Rinascimento: Rivista dell’Istituto Nazionale di Stori del Rinascimento 2 and ser., no. 36 [1996]: 327–73; Burman, ‘Polemics,’ 205 and fig. 3. The manuscript, dedicated to Federico da Montefeltro, was apparently meant for display, as much as anything. It contains lavish illumination, including the shield of the Dukes of Urbino, and the translation is faulty. The volume contains no marginalia and shows no evidence of ever having been read.


64. Hamilton, Europe and the Arab World, no. 50; Bozzi, ‘From Venice to Cairo,’ 59 and pl. 75.


67. Graham, Beyond the Written Word, 96–7; Efim Rezvan, ‘Qur’an VI.’

68. On the two readings, see also Adrian Brockett, ‘The Value of the baths and Warsch Transmissions for the Textual History of the Qur’an,’ in Approaches to the History of the Interpretation of the Qur’an, ed. Andrew Rippin (Oxford, 1988), 31–45.


CHAPTER TWO

Materials

THIS BOOK COVERS the development of calligraphy written in Arabic script on supple supports, and our survey begins with the three main materials used in the Islamic lands – papyrus, parchment, and paper. 1 Papyrus and parchment, the only two writing materials mentioned in the Koran, were preferred in early Islamic times, but they were eventually replaced by paper, which was both cheaper and easier to use. It also received the most elaborate preparation, and the development of specialty papers designed as supports for fine calligraphy became an art form in itself. The nature of the support also affected the type of pens and inks used and therefore the development of different scripts.

Supports

Of the three supports used in the Islamic lands, the most limited – both chronologically and geographically – is papyrus. 2 Papyrus (Arabic qirat), from which we derive our word paper, is made from a tall freshwater reed native to Egypt, Cyperus papyrus. Used as early as 3000 BCE, it became the main writing support in Egypt in classical times, since it was easier to handle than available alternatives like wood, skins, and clay tablets. Egyptians maintained a monopoly on production, and papyrus remained the main writing support in Egypt until the late tenth century, when it was replaced by its cheaper rival, paper. When manufactured, papyrus is light-colored, smooth, strong, and flexible. With age, however, it becomes brittle, and most specimens are now brownish. It can be made in a range of thicknesses and qualities. Official documents, for example, are done on the finest quality.

Classical and medieval sources such as Pliny the Elder (writing around the year 70 CE) and Abu’l Abbas al-Nabati [d. 1339] describe how papyrus was manufactured. 3 Although the sources differ in detail, the main steps are consistent. The stalk was cut into lengths, the outer layer of the plant peeled off, and the stalk split. The resulting sheets or strips were laid in two layers at right angles to each other so that the fibers of the stem ran horizontally on one surface and vertically on the other. No glue was necessary, for the natural gummy substance released when the stalks were cut served to bind the pieces
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Figure 2.1 Drawing of the typical papyrus roll used in early Islamic times.

The typical roll comprised twenty pieces of papyrus, each made up of two sheets pasted together at right angles. The fibers run vertically on the inside but horizontally on the exterior, thereby helping to maintain the shape of the roll.

A heavier sheet called the protocollon was pasted in the opposite direction to the beginning of the roll; it contains the text of the protocol inscribed horizontally on the inner side. Together into a sheet as they dried. Once dried, the square sheet was rubbed and beaten with a mallet to smooth the surface.

The sheets in turn were pasted to form a roll, which could measure more than two meters in length. On the outside, the fibers ran horizontally, perpendicular to the length of the roll, thereby helping to preserve its shape [Figure 2.1]. On the inside, the fibers of the papyrus ran vertically, parallel to the length of the roll. In early Islamic times the typical roll comprised twenty sheets, as it had in Roman times. Papyrus was sold in complete rolls or in sections comprising one-sixth of the roll. These sections were called tamar, from the Greek tomantron.

In both classical and early Islamic times, an extra and heavier sheet of papyrus was attached to the roll for the heading. Called a protokollon [whence the English protocollon], this preliminary sheet was attached to the other sheets in the roll in the opposite fashion. In Islamic times, the protocol, or text on the inside of this preliminary sheet, was written in Greek until 74 or 75 (693–9 CE) when bilingual protocols were introduced under the Umayyad caliph 'Abd al-Malik. From the time of the Umayyad caliph Hisham [r. 724-43], the protocol was written solely in Arabic. Arabic protocols contain the basmala, or invocation to God, various religious formulas from the Koran [e.g., 3:173, 9:33, and 96:1], prayers for the Prophet, the names of the caliph and governor of Egypt/ head of the provincial treasury or both, the place of production, and sometimes the name of the supervisor. All extant Arabic protocols are written with bold strokes, measuring some 5 mm, probably using a brush or bulrush cut on a slant [Figure 2.2]. In later examples specially colored inks were used to distinguish all or parts of this text. By contrast, the main part of the document was written with a split reed pen, which can leave a double line outlining the strokes of the letters. It produced a much narrower stroke, measuring approximately 1 mm. Thus, even in documents from early Islamic times, copyists were aware of the visual impact of distinguishing the heading by using a larger or different script with attenuated letters and colored ink. The protocol (and the papyrus on which it is written) was evidently valuable, because the protocol sheet was sometimes detached from the roll and the reverse reused for another purpose. This fragmentary papyrus with the Arabic protocol on one side, for example, contains ten lines from a letter added on the other side.

In early Islamic times papyrus was reserved for documents and letters. A few papyrus fragments bear Koranic verses, but they seem to have been personal anthologies or talismans, and no complete copies of the Koran written on papyrus are known. Muslims clearly deemed papyrus inappropriate to support the divine revelation, as had Jews and Christians, who used parchment for copies of the Torah and the Bible. Papyrus was too closely associated with the bureaucracy and the profane.

Figure 2.2 Fragment of a protocol.

This fragment contains a protocol written on papyrus in Arabic in a brownish ink with a large pen or brush whose stroke measures 5 mm. The heavier sheet used for the protocol often became detached and was reused, as here where the other side contains ten lines of a letter probably written in the ninth century.
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Instead, the material used to make codices in early Islamic times, as in earlier periods, was parchment, known in Arabic as raqq, riqq, or iild and referring to the skin of various animals. Goat, calf, donkey, and even gazelle skins are sometimes mentioned in the sources, but they are unlikely and unverified by testing, and the most common was sheep skin. To make a suitable surface for writing, preferably with both sides as similar as possible, the skin had to be carefully prepared. It was cured, scraped to remove any fat or flesh remaining on the inside, sanded, stretched taut, and then dried. The process took weeks.

Despite these preparations, it is often possible to distinguish the hair from the flesh side of a parchment sheet prepared in the Islamic lands. Traces of scraping, for example, are often visible on the flesh side, which is generally whiter and velvety to the touch. The ink adheres better to the hair side, which often shows traces of follicles (Figure 5.4). The size of the parchment folios depends, of course, on the size of the animal. The largest examples known, such as the parchment leaf in a marriage contract between Kirwass ibn Humayd and 'Aziza, daughter of someone whose name as been read as Khadij, in Ramadan 461/June-July 1069, measure 85 × 82 cm.

Parchment could be tinted. Some surviving examples from the Islamic period are tinted orange, and in the most famous case blue (Figure 4.10). It was difficult, however, to dye finished parchment since immersing the sheet in a vat of liquid dye can cause it to shrink or cobble. Therefore, color was usually added to parchment by painting it with a colored substance.

Parchment was an expensive material; its value is evident from that fact that it, like the protocol sheet, was sometimes reused. The parchment could be passed or scraped and then reinscribed with another text as a palimpsest. Some of the folios from a very old copy of the Koran found hidden in the ceiling of the mosque at San'a in the Yemen, for example, are rewritten over another text (Figure 4.7).

Old parchment sheets were also reused in bindings. Sometimes they were pasted to the inside of a leather-covered wooden board. Such a pasted down functioned like a doublure, serving to decorate the interior of the binding. Sometimes the parchment sheet also had a structural function. It could be folded around the first and last gatherings of the textblock, then sewn together with them, and glued to the inside of the cover. In this way, the parchment leaf provided a bond, albeit a weak one, between textblock and binding. The only complete book preserved in the cache found in the mosque at San'a is made in this way. Parchment sheets were also cut up into bands to reinforce the spine of the textblock.

For use in manuscripts, parchment leaves were generally ruled with a dry point or occasionally marked with black lead or ink. Somewhat contrary to expectation, in early Koran manuscripts on parchment, this ruling, which was commonly used for the illumination, was not often used to guide the calligrapher in transcription, even though the textblock was often set out along geometric lines. One of the signs of a good calligrapher in this period was his ability to write uniformly without a guide. One of the rare exceptions is the so-called Blue Koran (Figure 4.10), and the ruling found there can be used as evidence supporting a late, probably tenth century, dating.

Paper, the third material used as a support for writing in the Islamic lands, was the last to be introduced but became the most common and the cheapest. Paper had been invented in China several centuries before the Common Era, and merchants and missionaries quickly spread paper and knowledge of papermaking from China to neighboring lands. Both the material and the technology traveled westward along the Silk Road, by the eighth century both were exploited in Central Asia. According to the most famous account repeated by the Arab historian al-Tha'ali`i (d. 1038) in his Book of Curious and Entertaining Information, Chinese prisoners captured by the Arab commander Ziyad ibn Salih introduced papermaking to Samarqand in 751 after the battle of Talas, in which the Arabs defeated the Chinese. Although al-Tha'ali`i's details may be wrong (why, for example, would papermakers he solideris?) and his story somewhat of a topos, this general context for the introduction of paper to the Muslim lands is probably correct.

The Central Asian origin for the Islamic tradition is confirmed by the first Arabic word for paper, kaghad, which derives from Sogdian and Uyghur words. They are commonly thought to derive in turn from the Chinese word gu-zhi, 'paper made from paper-mulberry bark,' although recent research suggests that they may in fact derive from the Greek chartas, itself the source for another early Arabic word for paper, qittas. It referred initially to papyrus, papyrus rolls, and parchment; qittas was used in this sense in the Koran (6:67 and 6:91), with reference to writings on separate sheets. The standard Arabic word for paper - common by the ninth century and still used today - is waraq [pl. waraq], literally meaning foliage or leaf, probably a short form of the phrase waraq qittas, leaf of paper.

Under the 'Abbasids in the ninth century, paper replaced papyrus and parchment for record-keeping in the chancery. The great North African historian and philosopher Ibn Khaldun [1332 – 1406] credits al-Farabi, Yahya al-Barmaki (d. 808), vizier to the caliph Harun al-Rashid, with introducing paper-manufacturing to Baghdad. According to Ibn Khaldun, the vizier did so because parchment was in short supply and he needed more writing materials. Paper also had one great advantage over other supports: since paper absorbed ink, the writing on it could not easily be erased, as it could from papyrus and parchment. Documents written on paper were therefore more secure from forgery.

The new availability of paper in the ninth century spurred an extraordinary burst of literary creativity in virtually all subjects from theology to the natural sciences and belles lettres. Scholars began to copy books on paper. The oldest Arabic book copied on paper to
survive is a manuscript dated to 848 that was discovered recently in the regional library of Alexandria, Egypt, and other loose pages or undated books may be earlier. The second oldest, which is better known and well published, is a fragment of a treatise by the grammarian Abu 'Ubayd [d. 838] on unusual terms in the Traditions of the Prophet dated Dhul-Qa'da 252/November-December 866 [Figure 5.1]. It is made of stiff opaque paper that has turned dark brown and has a tendency to split along the edges, with text written in brownish black ink in a round hand.

From the ninth century, paper was regularly used in the Islamic lands for many types of manuscripts, including Christian, secular, and theological texts. There seems, however, to have been some resistance to using this new material for transcribing the Koran, for the first surviving Koran manuscripts copied on paper date from almost a century later. The earliest [Figure 5.3] is a four-volume vertical-format manuscript transcribed by the calligrapher 'Ali ibn Shadhan al-Razi (i.e., from Rayy in northern Iran) in 361/971-2.22 The most famous early manuscript of the Koran on paper [Figure 5.8] is that transcribed at Baghdad in 391/1000-1 by the noted calligrapher 'Ali ibn Hilal, known as Ibn al-Bawwab.23

The introduction of paper seems to have brought other changes in book production. It engendered the development of new styles of calligraphy. 'Ali ibn Shadhan al-Razi, for example, copied his Koran in a distinctive style with diagonal or bent letters, and Ibn al-Bawwab used a distinctive rounded hand. In addition, the typical book format changed from horizontal (landscape) to vertical (portrait). Despite the introduction of paper, parchment remained common for Koran manuscripts at least until the tenth or eleventh century and continued to be used in the Maghrib until the fourteenth century.24

Only one brief account of papermaking survives from medieval Islamic times. It is part of a treatise on making books, *Umdat al-kuttub wa'tdat dhawi al-alab* (Staff of the scribes and implements of the discerning), written by al-Mu'izz ibn Badis (1007–61), prince of the Zirid dynasty which ruled what is now Tunisia and eastern Algeria from 1016 to 1066.25 Ibn Badis describes making paper from raw flax on a floating screen. Examination of extant paper shows, however, that for centuries this rather primitive technique had been superseded throughout the Islamic lands by more sophisticated methods in which waste materials, such as rags and old ropes, were exploited as the primary source of fiber and the mold was dipped into a large vat of pulp suspended in water. This is only one of several discrepancies between what Ibn Badis describes and what extant specimens tell us. These discrepancies suggest that Ibn Badis' information should not necessarily be taken as fact.

Papermaking, which requires clean water to soak the flax and fast flowing water to power the mills, spread across the Islamic lands from Central Asia to Iraq, Syria, Egypt, North Africa, and finally Spain. Islamic paper was prized in medieval times and often exported to Europe, where papermaking developed only in the eleventh and twelfth centuries after Muslims had established paper mills in Spain and Sicily. By the fourteenth century, however, Europeans, who had access to more abundant water and waterpower, began to make cheaper and more abundant, if at first not necessarily better, paper than that manufactured in the Islamic lands. By the mid-fourteenth century chanceries in North Africa had started to use Western paper, and European paper was occasionally used for manuscripts produced in the eastern Islamic lands. A single-volume manuscript of the Koran ascribed to Iran or Iraq c. 1350, for example, is transcribed on Italian paper datable to the 1340s.26 This manuscript, however, is the exception rather than the rule. While European papers made steady progress in the Islamic lands to the south and east of the Mediterranean, paper-makers in Iran and the east produced increasingly fine papers well into the sixteenth century.

To make paper worthy of fine calligraphy, it has to be prepared properly. The paper has to be sized to prevent the ink from penetrating the fibers. The size (ahar) used in Islamic paper was some sort of starch-based substance, usually a mixture of rice powder, starch, or quince kernels along with egg white and other ingredients. It could take the form of a liquid, paste, or powder. Sizing allows the calligrapher to correct mistakes since the ink remains on the surface. The ragged edges of letters, for example, can be wiped away with a bit of cotton, licked off, or scraped away.

Next, the paper is rubbed or burnished to make it smooth and stabilize the sizing. Burnishing has to follow sizing relatively quickly, for if paper is not burnished within a week, the size will crack during burnishing. To burnish a sheet, the craftsman usually laid it on a smooth surface such as a wooden plank and then rubbed it with some sort of smooth heavy tool. Ottoman calligraphers used a wooden burnisher with handles on either end and a protruding piece of polished flint in the center, and a marginal illustration from an album compiled for the Mughal emperor Jahangir (Figure 2.3) shows a craftsman using a heavy mallet.27 Others used an agate egg or slate slab instead.

Most paper used for fine manuscripts or calligraphic exercises was then ruled with a device called a *mestar(a) or mistara*, a set of strings stretched over a pasteboard, or occasionally wooden, frame (Figure 2.4).28 To make the ruler for pages in a particular manuscript or for a particular type of calligraphic exercise, the calligrapher calculates the proper spacing of lines on the page. He draws the arrangement of the piece of pasteboard and then sews the lines with a single thread. Horizontal lines indicate the baselines for the calligraphy; vertical lines at the sides indicate the written area. This specimen, for example, rules a prose text with twenty-five lines in a block measuring 16 by 0 cm. To use it, the craftsman placed the ruling frame below the sheets of paper and then rubbed, either with his nail or...
Figure 2.3 Page from an album made for the Mughal emperor Shah jahan in the opening decade of the seventeenth century.

The center contains a calligraphic exercise (qir'a) in nasta'liq by the Timurid calligrapher Mir 'Ali Husayni Haravi; the gold-painted border shows six vignettes of bookmaking. Reading from upper right counterclockwise, they show a calligrapher burnishing a sheet, a bookbinder stamping a cover and another trimming the edges of a bound volume, a carpenter making a wooden bookstand, an illuminator melting gold, and a calligrapher writing in an already bound volume.

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Figure 2.4 Mastar.

The mastar, a set of cotton strings stretched over a frame, was used to rule the page. This example, which produces a written area with twenty-five lines measuring some 16 x 9 cm, probably dates from seventeenth- or eighteenth-century Iran or India, to judge from the marbled borders, but such devices were used already in the early middle period.

with a heavier tool, producing thin guidelines that are raised on the upper surface of the support and indented on the lower.

The mastar became popular only in medieval times. Calligraphers working on paper in early Islamic times apparently continued the practice of those working on parchment and did not rule their manuscripts in this way. There is no trace, for example, of a ruling in the manuscript of the Koran penned by Ibn al-Bawwab in 391/1000-1 (Figure 5.8). Other methods of ruling were also used, particularly in early Islamic times. A large, seven-part manuscript of the Koran
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copied on paper in broken cursive and datable to the eleventh century, for example, was ruled with a drypoint, like some parchment manuscripts.30

Ruling became popular during the period of the Six Pens [see Chapter 7]. The master calligrapher Ya'qub, for example, used it in his Koran penned in 685/1286 (Figure 7.1). Standard from this point on, ruling became the basic unit of measurement for a manuscript. Thus, the sixteenth century chronicler Dust Muhammad reports that when Baysunghur wanted a copy of the album (jung) that had been prepared for the Jalayirid ruler Sultan Ahmad (r. 1383–1410), the Timurid prince asked his artists to produce a book in exactly the same shape and ruling (qur' wa mustar).31 In later times, the horizontal ruled lines of the paper could also be used to guide the calligrapher, although they are technically not a ruling.

Special papers

Of all the steps taken in the Islamic lands to prepare paper for fine calligraphy, the most distinctive was to tint the sheets, and colored and decorated papers have been popular for the finest manuscripts and individual specimens produced across the Islamic lands since medieval times.32 Before the invention of chemical bleaches in the eighteenth century, the color of the support depended on the materials from which it was made. Early Islamic papers [e.g., Figure 5.1] have a brownish cast, but by the thirteenth century a taste had emerged for whiter paper [e.g., Figure 7.2], a change suggesting that papermakers had refined their materials and techniques. By the fifteenth century, the taste for colored paper was firmly established. The Timurid artist and librarian Simi Nishapuri reports that it is better to give paper a slight tint because white is hard on the eyes.33 Simi adds that the master calligraphic specimens he observed were done on tinted paper, and extant specimens [e.g., Figure 7.14] bear out his claim.

The taste for such paper probably developed from examples imported from China, where colored papers had been produced since pre-Islamic times.34 At first artists in the Islamic lands may have used imported papers, but the expense and desirability of these exotic commodities led artists to develop their own techniques and materials for making colored, gold-decorated, and marbled papers as well as paper-cuts. The first surviving examples of dyed paper made in the Islamic lands date from the period of Mongol rule in Iran, when it was used for both individual specimens and entire manuscripts. The most popular colors were red or orange, although one manuscript in the Chester Beatty Library has paper dyed olive.35 The taste for colored papers spread quickly to the Maghrib, as, for example, in a famous five-volume manuscript of the Koran datable before 807/1405 that is copied on brownish-purple paper (Figure 9.13).36 Persian treatises give many sources, both vegetal and mineral, used to obtain these colors,37 and the Ottomans followed a similar process to color their papers.38

From the end of the fourteenth or beginning of the fifteenth century, calligraphers in Iran and adjacent areas of the eastern Islamic lands developed even fancier types of specially decorated papers. One technique was to embellish the sheet with gold-flecking or gold-sprinkling [Persian zarafshan]. Various sorts of gold and silver paper had been used in China at least since the Tang period (618–907).39 As part of the exchanges between Persian rulers and the Ming emperors in the late fourteenth and fifteenth centuries, rolls of Chinese paper splashed with gold and painted in gold with birds, flowers, and landscape scenes were imported to Iran where they were cut up and used for several manuscripts made for the Timurids and their contemporaries. The earliest dated examples to survive are two copies of Farid al-Din ‘Attar’s poetry made at Herat for the Timurid ruler Shahrukh c. 1438.40 Colored and gold-decorated Chinese papers were apparently taken from Herat to Turkoman courts in Western Iran, where they were used for several smaller manuscripts. One example [Figure 3.5] is a

Figure 3.5 Double page from a copy of Iltizam Khwarazmi’s Makhzan al-asrar transcribed by Sultan ’Ali Qa‘ni for the Aggyoura ruler Ya‘qub and finished on 25 Jumada I 883/24 August 1478. Sultan ’Ali Qa‘ni transcribed this small manuscript on Chinese paper that was dyed blue and decorated in gold with a landscape of a river, hills, and two birds in a flowering tree. The individual sheets were cut both horizontally and vertically from the roll to maximize the amount of gold painting visible around the written area.
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copy of Mir Haydar Khwarazmi’s Chaghatay poem Makhzan al-Asrar [Treasury of Secrets] made for the Aqquyunlu ruler Ya’qub anq finished on 23 Jumada I 883/24 August 1475.41 The text on its thirty-five small folios is copied on paper that has been dyed light blue, sprinkled with gold, and painted in gold with birds, flowers, and landscape scenes. Such imported paper was clearly precious, for the Aqquyunlu artists cut sheets both horizontally and vertically from the rolls in order to maximize the amount of gold-painting that fell in the margins and would remain visible after Sultan ‘Ali Qa’ini had transcribed the text in the center of each page. Here, for example, the right page was cut horizontally from the roll and reoriented 90° clockwise so that much of the landscape scene with the pagoda falls in the margin. Aqquyunlu artists’ desire to maximize the painted area is clear from the fact that other pages in the manuscript are made by cutting them vertically from the roll or reorienting them in the opposite direction.

Given the cost of the gold-decorated paper imported from China, it is no surprise that Iranian artists began to make their own. Though not as fine quality as the Chinese prototype, the local variety was also expensive and heavy. Gold-sprinkled paper was used mainly, though not exclusively, for borders and was particularly in demand at this time when painters were exploiting the aesthetic possibilities of the margin.42 It was typically used in the scrapbook album [muraqqet] of calligraphy and paintings to unite the varying pages with disparate compositions into a single book. Since gold did not tarnish, it was more effective than silver, which was occasionally used in the same way, but which tends to darken near the margins where the air seeps between the pages and oxidizes the metal.

Texts and extant examples show that gold-speckled paper was popular in Timurid and Turkoman ateliers. According to Dowlatabad [d. 1494 or 1507], amir and courtier at the court of the last Timurid ruler Sultan Husayn [r. 1470–1506], gold-sprinkling was already practiced by Simi Nishapuri, an artist who had worked in Khurasan at the court of Baysunghur’s son, ‘Ala’ al-Dawla [d. 1460], and the small but fine anthology copied by Shahr al-Din Husayn at Shamakhi in 878/1478 already uses three colors (blue, pink, and mauve) of gold-sprinkled paper.43 From the late fifteenth century onward gold-sprinkled borders were typical of the finest poetic manuscripts made in the eastern Islamic lands. Superb gold-sprinkled borders were added, for example, around the pages of cut-out calligraphy in the copy of the poems by the Timurid ruler Sultan Husayn (Figure 2.6).44

From the sixteenth century onward, borders with even more elaborate gold painting became standard in prize manuscripts made for the Safavid, Uzbek, and Mughal courts. Many designs incorporate arabesques, and some examples, such as the gold-painted margins in the superb copy of Nizami’s Khamsa copied by Shah Mahmud Nishapuri at Tabriz between 1539 and 1543 (Figure 10.8), have birds and animals cavorting among flowers and trees.45 Gold-decorated
borders were also common in the formally planned albums containing specimens of calligraphy and painting made for these courts. These albums typically have a double page of calligraphic exercises with figural borders followed by a double page of paintings with floral or abstract borders. The finest of these decorated borders were produced in Mughal India, where leading artists were often responsible for the marginal scenes.46

The recto of a detached page from an album made for the Mughal emperor Jahangir is a good example (Figure 2.3).47 The gold-painted border shows six vignettes of book embellishment done in the style of the court artists Aqa Riza and Goyurdhan. The borders surround a calligraphic specimen (qat'lı) by the sixteenth-century calligrapher Mir 'Ali, whose signature is visible in small letters written vertically along the left side in two cloud panels.48 Although his art was not universally appreciated in his own day, later connoisseurs avidly collected his work.49

Another type of decorated paper popular for calligraphy in later Islamic times was marbled paper, called raghaz-i abri in Persian and ebru in Turkish, both derived from the word for cloud. To make it, the marbler uses a brush or pipette to add drops of colorant to the surface of a bath, usually a mixture of gum tragacanth and water. Gall is sometimes added to help disperse the colors on the surface. The marbler works the drops of color with pointed instruments and combs to create shot patterns. Once he has obtained the desired pattern, he slides a sheet of prepared paper on the surface of the bath, and immediately it takes up the design created. For each sheet the marbler has to start afresh.49

Scholars have debated where and when marbled paper developed in the Islamic lands. Some have argued for India, others for Iran or Turkey; some for the fifteenth century, others for the sixteenth.50 In fact, the introduction of marbled paper in the Islamic lands may well have been another adaption of a type of paper imported from China. Literary references suggest that marbled paper, like gold-decorated paper, had been produced there for several hundred years, and the technique of marbling, like gold-decorating, seems to have spread from China to Mamluk Egypt and Timurid and Turkoman lands in the fifteenth century. Some of the earliest attempts at introducing colored patterns to paper, a sort of proto-marbling, are found in small onglons albums of Persian poetry made in Iran in the mid-fifteenth century. One in the Bibliothèque Nationale includes sheets that are tinted ocher, violet, or salmon. Color was added in other ways as well. On one side of some sheets, the papermaker splattered color, on others he stenciled figures or geometric compositions. As in the albums, the spattered and stenciled pages are arranged so that when the volume is open, facing pages have the same decoration (although some have now been detached from the volume). On yet other pages, the papermaker added colorant to produce the effect of a red or brown slur (coule). The manuscript is a masterpiece: in addition to the many colored pages, it is a calligraphic tour de force with interlacing bands containing fine nasta'lıq script.52

By the end of the fifteenth century, marbling was an assured art in Iran, as attested by a tiny anthology transcribed by Sultan Muhammad Nur at Herat in 1430-1435.53 The calligrapher, a disciple of Sultan 'Ali Mashhadi who worked at Herat in the early Safavid period, was renowned for his work in color, and this small manuscript has pages with red and orange marbling alongside other pages tinted beige, pink, and green. Sultan Muhammad Nur's colleague Mir 'Ali Haravi did similar work,54 and some sheets were sent as gifts to India.55 Although marbled paper was used occasionally as a support for calligraphic specimens, it—like dyed and gold-decorated paper—was typically reserved for other purposes, such as endpapers, bookcovers, and most often spectacular borders, as in the ones added by the Safavids around text pages in the copy of Farid al-Din 'Attar's Mantiq al-Tayr (Figure 7.17).56

One other paper technique, however, was used for the calligraphy itself: the paper-cut, called qat' in Persian and kat in Turkish. Like gold-decorated and marbled papers, the art of paper-cutting seems to have developed in Timurid times, and it too may have come to Central Asia from China, where there was a long folk tradition of paper-cutting.57 In the Islamic lands, as part of the florescence of the arts of the book, paper-cutting was expanded from figural and floral subjects to arabesques and writing.

Paper-cutting was first applied to calligraphy in Arabic script in the fifteenth century. Examples of collage [cut-out letters pasted onto a background of contrasting color, usually light on dark], and, more rarely, endpapers [a sheet of contrasting color mounted behind a sheet from which letters are cut out] survive from the fifteenth and sixteenth centuries. One of the earliest is a small manuscript of the hundred sayings attributed to 'Ali ibn ibn Talib copied by Muhammad ibn Sayyid Ahmad ibn 'Ali al-Sufi al-Maragh in 1475-1476.58 The manuscript is a technical tour de force, displaying the calligrapher's skill in a wide variety of scripts, including the Six Pens, nasta'lıq, and ta'lıq, executed in both collage and découpage.

Cut-out calligraphy, like so many other arts of the book, became popular at the court of the Timurid ruler Sultan Husayn. The most famous example is a manuscript of his collected poetry in the variant of Turkish known as Chaghatay, eastern Turkish, or Turki.59 To make this page with couplets with a ghazal, or ode, about union with God (Figure 2.6), sheets of pale-blue, yellow, white, and brown paper were cut to form letters, syllables, and words in nasta'lıq script that were pasted onto dark-green ground. An intricately illuminated band was added at the top, and the page glued to another in the contrasting color [blue]. The sandwich page was then inserted into gold-flecked green borders like a window inside a frame, and blue, orange, and gold rulings added around the page with written area, leaving space at the bottom for the descending tail of mim, to hide the join between
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window and frame. The cut-out work is often attributed to Shaykh 'Abdallah of Herat, considered the best practitioner of this art in Timurid times. He was but one star in the firmament, and the many Persian craftsmen and artists who emigrated to Istanbul in the early sixteenth century probably brought the art of paper-cutting to Ottoman Turkey, when it reached even greater heights.

The arts of coloring, decorating, and cutting paper were closely connected, and many artists were skilled in more than one craft. The interrelation of these paper arts and calligraphy can be seen in the opening pages [Figure 2.7] to a small collection of forty hadith, or sayings of the Prophet, made for the Ottoman prince Mehmed c. 1540. The colophon is signed by the cut-out calligrapher 'Abd al-Hayy 'Ali. The eight pages have horizontal panels of Arabic writing in the large script called tawqi', alternating with diagonal panels of the Persian translation written in nasta'liq. The letters, cut out in white or pale blue, as well as point ing and dotting, cut out in gold, are pasted on deep rose or olive-green grounds. Some margins are plain, others gold-sprinkled, and still others marbled in blue and white.

This collection of hadith also marks the first known appearance of florists' flowers in Ottoman art, a subject that was to dominate Ottoman court art from the late sixteenth century. The illuminated headpiece is adorned with blue and red flowers, and the doublure of the lacquered binding is decorated with a garden of roses, tulips, prunus, violets, dianthus, and iris. These floral themes were soon incorporated into the other fancy papers made for the Ottomans. Some of the most elaborate marbled papers made for the Ottomans contain stylized flowers, including pansies, carnations, hyacinths, tulips, and daisies. Similarly, in Ottoman hands, the art of paper-cutting was not confined to calligraphy but expanded to miniature gardens replete with flowers, shrubs, and trees executed in collage that mimicked the actual gardens cultivated by the sultans. The greatest of the paper-cutters of late Ottoman times was Fakhr al-Din Bursa (d. 1617), the only paper-cutter mentioned by the Ottoman chronicler Mustafa 'Ali in his history of calligraphers and artists written in 1580 and one whose work was deemed worthy of royal albums.

The paper-cut marks the ultimate conceit in the art of calligraphy. Whereas calligraphers in earlier periods had expanded their art by refining new scripts, calligraphers at these well-to-do courts in later Islamic times refined the same scripts but developed new and some what exotic techniques in which to execute them. Some Ottoman calligraphers tried to hide their penstrokes and make the flow of the ink appear seamless, even when writing a long phrase that must have required the calligrapher to charge his pen repeatedly. The same effect is achieved here by cutting the word out from a single sheet, thereby removing ink and flow from the process entirely. Although somewhat of a rarefied idea, this art lives on today in the combination of cut-outs and calligraphy practiced by modern Turkish artists.

Figure 2.7 Opening double page from a collection of hadith prepared for the Ottoman prince Mehmed, c. 1540. This short manuscript epitomizes the arts of the book as refined under the Ottomans in the sixteenth century, with tinted, gold-sprinkled and marbled papers; cut-out calligraphy by 'Abd al-Hayy 'Ali; and exquisite illumination, including the first dated example of florists' flowers. Each full page has three horizontal panels of Traditions written in Arabic in tawqī' script, each followed by two explanatory couplets in Persian cut-out in the hanging nasta'liq and set either diagonally in the middle or horizontally at the top and bottom of the page. The pages thus contrast languages, scripts, and colors as symmetry and balance triumph over readability.

Pens and pen cases

The traditional implement used for writing Arabic script is the reed pen, or qalam (Figure 2.8). Such pens wear out quickly, and no examples have survived from medieval times, so we must depend on textual sources to establish how such pens were traditionally made. According to the tenth century geographer al-Muqaddasi, for example, yellowish white reeds were cut from beds in marshy or wet areas. The
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Figure 2.8 Reed pens and ingredients for inks, including gum arabic, gallnuts, pomegranate skins, walnut shells, fenugreek, and snath.

Calligraphers in the Islamic lands always used a reed pen (qalam). Each different script required a reed of a different size with a differently cut nib. Metal tannic inks were made from gallnuts and metallic salts such as vitriol or alum bound together with gum arabic. Carbon-based inks were often made from lampblack, but calligraphers today in the Maghrib pen amulets from snath, made from sheep's milk rich in carbonized salt; the natural grease from sheep's wool.

marshes of Iraq and the swamps of Egypt and Fars were renowned for their firm reeds that did not wear away quickly and had straight fibers. The pen was made from a tube of reed cut between two knots. Like most artists, calligraphers lavished great care on the implements of their craft, and the desire for a durable material for the pen led calligraphers in modern times to exploit new and often imported materials, whose exoticism added to their allure.46 In the early nineteenth century, for example, Javanese pilgrims to Mecca introduced pens made from the hard, straight, and slender thorn of a palm tree native to Indonesia and Malaysia. Ottoman calligraphers readily adopted these 'Java pens,' which were extremely durable and had little need of recutting, to transcribe the Koran and other lengthy texts, affixing a normal reed to the thorn pen as a handle. Calligraphers in late Ottoman times also used other materials such as bamboo and wood to make larger pens for writing thick or large letters needed for the enormous cardboard or wooden panels (Turkish levhalat) [Figure 11.1].

These other types of pens, however, are the exception rather than the rule: they were used only in the last few centuries when new and refined techniques of writing and papermaking were developed, particularly under the Ottomans. In most places and times, the reed pen was standard and its use so ubiquitous that it became a literary cliche. The type of reed used for a pen was also used for a flute.

[Persian nay], and poets and mystics often compared the two.49 The mystical poet Jalal al-Din Rumi [d. 1273], also known as Mawlavi, evoked the reed flute in one of the most famous passages from classical Persian poetry, the stunning verses opening his long poem, Mathnavi-yi Ma'navi [The Mathnawi of Intrinsic Meaning]. Listen, he says, to the song of the reed flute as it laments its separation from the reed bed, reveals the secrets of love and longing, and casts the fire of love into the human soul.49

Poets evoked the reed pen in similar terms. It too has been separated from the reed bed. It too is hollow, and it too is filled with sweetness when conveying the words of love. Both recount the secrets in men's minds: the pen puts them on paper in undulating lines, the flute expresses them in undulating strains of notes. Modern poets continue to use this imagery. Hasan Massoudy began his recent book on Arabic calligraphy, Calligraphie arabe vivante, with a maxim by the French poet and surrealiste Louis Aragon [1897-1982] that 'From the musical line and the written line have emerged the flute and the pen.'49

To be used for writing, the fresh reed has to be seasoned. Literary sources again provide somewhat generalized descriptions, which may be apocryphal. Some mention, for example, that the reed should be left to steep like hemp and kept submerged in water. Others report that the reed was buried, traditionally for a period of four years, in horse manure which maintains a constant warm temperature. In both cases, the reed hardened and darkened to reddish, light, or dark brown, or even black.49

The seasoned reed is then sliced at the thicker end to form a nib (jilja), which is slit to a point. The calligrapher trims the nib by laying the reed against a small flat slab (Arabic miqadda, Persian nay-qat), generally a piece of ivory or bone that has a small groove to secure the tip of the pen. Using a special sharp knife with a long handle, the calligrapher then slits the point with a sharp transverse cut. This opening (shagq) becomes a reservoir containing a small store of ink, which flows down to the nib as the calligrapher writes. Court calligraphers in later times sought exotic and expensive materials for these implements as well, using tortoishell or mother-of-pearl for the slab and gold-inlaid steel, enameled gold, ivory, coral, mother-of-pearl, or ebony for the handle of the penknife, sometimes embossing its blade with the maker's name.49 Calligraphers are said to have trimmed the nib while sitting cross-legged as they did while writing [Figure 12.1].49

Trimming the nib was a specialty; good cutting was considered half the script. To write the angular scripts typical of early Islamic times, the nib was usually trimmed flat, but with the predominance of round hands, an oblique cut became popular. The treatise by the seventh-century calligrapher Abu Hayyan al-Tawhidi, who wrote just at the time of this transformation from angular to round scripts, mentions that the pen can be nibbed in different ways: oblique, even, upright,
and inclined, but that the best is the oblique cut with a medium slant. This became the standard, particularly in the eastern Islamic lands; the Timurid calligrapher Sultan 'Ali Mashhadi, for example, also advocated a muddling cut in his section on trimming the nib. In later times, the letters were measured in terms of dots formed by pressing the nib of the reed pen on the paper. Placed at a 35° angle to the horizontal, the nib was drawn downwards and to the right to produce a perfect diamond. The area of the dot, and therefore its shape, depends on the width to which the nib has been trimmed, and the side of the diamond is equal to the width of the nib. This system was codified by the thirteenth century (Figure 6.11), but we do not know how much earlier it was used.

Close examination shows how frequently a calligrapher had to lift his pen to transcribe a single folio of the kufic script used in many early Koran manuscripts. To write the seven words on one page from the so-called Amajur Koran (Figure 4.2), for example, the calligrapher needed to lift his pen nearly thirty times. Independent arif, the first letter of the alphabet and the simplest, is a single stroke traditionally written by stroking down. To write it here, as in the last letter at the left in the first line, the calligrapher stroked down and to the right. The end of the stroke is darker due to the surface tension and pooling of the ink created as the calligrapher lifted his pen. The variations in density of the ink show that to write the previous syllable with the two letters lam (l) and waw, he used three strokes: the first from the top down for initial lam, the second for the head or eye of waw, and the third for the tail of waw, which were drawn from left to right. The first word on the second line, na'budu, has four letters, but required six strokes. In contrast, in regular handwriting such syllables and words are normally written without lifting the pen. Despite its appearance of calligraphy, the art of calligraphy was both time-consuming and carefully planned.

The slit in the nib holds only a small reservoir of ink, forcing the calligrapher to recharge his pen repeatedly. This is clearly a problem, and from medieval times calligraphers sought ways to improve the pen. The Fatimid caliph al-Mu'tazz (r. 953–75), for example, is said to have come up with the idea of a fountain pen that did not have to be dipped into an inkwell and did not drip. Despite doubts, the court goldsmith made one for him and after various improvements came up with a pen that could be rotated in the hand and inclined in all directions without the ink running out. This fountain pen must have been something of a curiosity, and no examples have survived.

Reed pens were usually stored in a pen case, known in Arabic as mijlama or in Persian as galamand. Many pen cases were rectangular boxes measuring about 19 cm. Fancy ones of metal or ceramic were often made to order for specific individuals by named craftsmen. The earliest dated example known is a bronze pen case made in 542/1148 and inscribed with Persian and Arabic verses about the pen (galam) and inkpot (dawat). It continues an earlier tradition, for a fragmentary piece of slip-painted earthenware made in the Samanid domains in the tenth century and inscribed with the name Muhammad ibn al-Fadl probably belonged to a pen case. Over time, pen cases became increasingly elaborate and larger, with a standard space for the inkpot (see below).

The galam was already an important symbol at the beginning of Islam. It is the opening lines of one of the first chapters of the Koran revealed to Muhammad. According to Traditions collected by the tenth century scholar al-Tabari, the pen was the first thing created by God so that he could write down events to come. This galam has been interpreted in two ways: either as a utensil for writing and like it, a divine gift, or as a shaft of light which inscribed all things that will happen until Judgment Day.

The pen became the symbol of the civil administration in Islamic society. By medieval times it was normally contrasted to the sword (sayf), which symbolized the military. Mamlik authors and artists frequently juxtaposed the two, as on the two superb inlaid bronzes made by Muhammad ibn al-Zayn – the Vasselon bowl and the Basilisk of St Louis – where the enthroned ruler is shown flanked by his amir of the sword on the right and his amir of the pen on the left. Contemporary Ilkhani paintings from Rashid al-Din's Compendium of Chronicles show similar scenes juxtaposing men of the pen and men of the sword.

**Ink and inkwells**

Two kinds of dark ink were traditionally used in the Islamic lands: carbon-based inks and metal tannate inks. In early Islamic times two different words were used for the two types. Midad, from maddo, to stretch out (i.e., the ink), was used for a paint type of ink whose most important ingredient is soot or carbon mixed with oil or plant gums. Hibar, from habbara, to write, referred to an ink that reacts chemically with the support. It was typically made from gallnuts [gel] and ferrous compounds that produced a dark brown color.

In later times the terms midad and hibar were used synonymously, but at least through the eleventh century, each seems to have maintained its specific meaning of either carbon or metallic tannate ink. We can deduce this from the treatise on making books, 'Umdat al-kitab, in which the author Ibn Badis, himself a calligrapher, gives many recipes for preparing ink. His second chapter is devoted to soot inks (midad), generally designated by geographical names [Chinese, Indian, Kufic, Persian, etc.]. Chapter three, by contrast, describes tannate inks (hibar), generally designated by their appearance [shining, dry, sunny, etc.] or components [acacia gallnut, myrobalan, myrtle, etc.].

Black ink based on carbon mixed with plant gums had been known since Biblical times and was used by both the Egyptians and the
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Romans. This type of carbon ink does not penetrate the support. It is water-soluble and erasable with water, partly because of the impene-
trable surface of the papyrus on which it was traditionally used. This type of ink was often associated with water. The Koran (18:109)
mentions that if the sea were ink (mis'ad) with which to write God's
words, then the sea would dry up faster than the ink would be
exhausted. Because of its water solubility, Persian poets evoked the
metaphor that on Judgment Day the tears of repentance would wash
off the black writing in the Book of Deeds.86

This type of carbon-based ink that adheres only weakly to the
surface can be contrasted to the second type of ink based on metal
tannates, in which mixtures of metal salts and tannins act to create small
amounts of acid that penetrate the support surface. The earliest
recipes for this type of ink mix metal salts (usually alum or copper
sulfates) with carbon-based preparations, probably to improve the
adherent qualities. Eventually, extracts of gall were mixed with iron
salt to produce the type known as iron-gall ink.

Like carbon-based ink, iron tannate ink has been known since
antiquity. It was used in early Islamic times, particularly on parch-
ment, where it penetrates the surface like dye. Examination of
several folios from early parchment copies of the Koran in the
Bibliothèque Nationale in Paris show traces of iron.87 This type of
tannate ink often erodes the surface, and its color is not stable. When
used on paper, it produces acids that eventually corrode the surface,
as on some of the Geniza documents.88

Eventually the two types of carbon and tannate ink were combined,
with one or more elements from one type added to the other. Traditi-
 tionally, lampblack was added to iron-gall ink, probably to help stabilize
the black color. A sixteenth-century source credits the renowned tenth-
century calligrapher Ibn Muqla [see Chapter 5] with this innovation,
as with so many others.89 The terminology also became confused, with
mis'ad and hibb used interchangeably. Most recipes were also mix-
tures. The Safavid chronicler Qadi Ahmad, for example, describes
making ink of soot (dudel), gum (samgh), vitriol (zuk), and gallnut
(tuz).90 The Ottomans used soot inks. The most developed formula
involves soot, dissolved gum arabic, and distilled water, mixed and
ground together. Ottoman calligraphers were also said to have col-
clected the lampblack produced by the oil lamps in the Suleymaniye
mosque. This ink was thus considered not only high quality but also
efficacious in imparting the mosque's spiritual blessing (baraka).91

Calligraphers in the Muslim lands also used a variety of colored inks
for rubrics, vocalization, and other decoration. Ibn Badis mentions red,
yellow, and green as the most important colors,92 and these are fre-
quently used as accent colors in early Koran manuscripts.93 So is blue.

Metallic inks made of gold, silver, and copper were also used.
Conservative prohibitions to the contrary, gold ink was used from
early times. Fragments of a Koran on parchment in the Bibliothèque
Nationale already show gold markings in the same style of writing as
that used for the calligraphy, and at least one early copy of the Koran
written in gold ink has survived.94 At least two techniques were used:
gold ink (chrystography), and powdered gold regularly dispersed on a
support to which glue had already been applied. The latter is recog-
nizable because the glue often leaves a brownish stain where the gold
has disappeared. The gold was applied, then burnished, and finally
rinsed with other colors to highlight the gilded motif.

The materials used for transcription have been analyzed only for a
handful of early Islamic manuscripts in the Bibliothèque Nationale.95
Despite the small size of the sample, these tests identified a group of
materials characteristic of manuscripts produced in the Maghrib and
distinct from those used in the east. In western manuscripts, for
example, red wax was typically made from cochineal, a dye obtained from
the crushed dried bodies of female insects, whereas in the east ver-
million was used. Similarly, blue was produced from azurite in the
west, but from lapis lazuli in the east. Artists in the west did not use
the same range of products to prepare their colors, with yellows being
the most different. These tests confirm the information about mate-
rials given in texts, such as that by Ibn Badis, who mentions that ver-
million (zanghafa) and minium or red lead (silqunik) were used for red
ink, orpiment (zarrith astar) for yellow, and verdigris (zanghar)
for green.

The use of the same materials for text and decoration suggests that
in early Islamic times the calligrapher may also have been
responsible for the decoration. Colophons report the same thing.96 By
the early twelfth century in Iran, however, there seems to have been a
division of labor between calligraphers and illuminators. A lavish
ly decorated manuscript of the Koran transcribed by 'Othman ibn
Muhammad at Bust [now in Afghanistan] in 505/1111-12 (Figure 6.6)
was gilded, according to a small signature on the last folio, by 'Ali ibn
'Abd al-Rahman.97 This division of labor continued in later times.98

Spectroscopic testing showed that a Koran manuscript copied in the
Maghrib in the thirteenth or fourteenth century had azurite blue for
diagnostic marks, but lapis blue for marginal decoration, suggesting
a similar division of labor. This calligrapher and illuminator's
Koran manuscripts produced at that time in the east are signed by
both calligrapher and gilder.99

The calligrapher stored his ink in an inkwell called dawat or some-
times miqbara.100 Inkwells come in a variety of materials and shapes.
Round glass pots were used in early Islamic times, but by medieval
times the small glass receptacles for the ink were often encased in
cylindrical containers made of glazed ceramic or inlaid wood or metal
and elaborately decorated with figures and inscriptions. These con-
tainers can be round, square, or domed, sometimes resembling small
buildings. Some later Islamic ones look like little tomb towers.101

Porcelain inkpots were popular in later times, and the Mughal cal-
ligrapher in the marginal illustration from the Jahangir album dips
his pen into a blue-and-white inkwell [Figure 2.3].