Craftsmen in Medieval Anatolia: Methods and Mobility

The following analysis of the two primary materials, namely stone and brick, and the methods of combining and manipulating them, is used to delineate a methodological framework for determining the processes required to build large-scale mixed-media construction projects. The specific focus here is on the situation in Anatolia in the late twelfth and early thirteenth centuries, but the principle of analysing the constituent elements of buildings in order to understand the working methods of the craftsmen is applicable to much of the architecture of the pre-modern world. In lieu of any surviving technical treatise, the detailed study of techniques and decorative motifs can provide a wider understanding of the training, geographic origins and mobility of the craftsmen responsible for the construction of the Islamic architecture of medieval Anatolia.[1] Stylistic and comparative analysis with structures in the wider Islamic-ruled world, from Iran and Central Asia to Syria and Egypt, can provide the evidence for assertions in regard to the origin and training of a number of the craftsmen working in Anatolia in the twelfth and thirteenth centuries.

Aside from the indigenous building traditions, two clearly discernible, external Islamic sources were integral to the development of a unique Anatolian architectural aesthetic in the first quarter of the thirteenth century. First, stereotomic stone-working methods, developed primarily for marble construction in Zengid and Ayyūbid Syria in the late twelfth and early thirteenth centuries can be found in Konya. Second, the brick and glazed-tile building style that flourished in northwestern Iran under Ildegüzid patronage in the twelfth century was used in a number of surviving buildings across Anatolia.[2]

This chapter presents evidence of craft practices gleaned from close analysis of buildings to in order to understand the working methods, mobility and origins of craftsmen active across Anatolia. Although the primary focus is on buildings with Rūm Saljūq patrons,[3] the mobility of craftsmen, and the fluidity of boundaries and political alliances, means that the results also apply to a number of the surviving Saltūkid and Megüjekid structures. The strong influence of, and in some cases on, the indigenous Armenian and Byzantine traditions,[4] alongside the evidence of Persianate brick and glazed-tile structural and decorative techniques is clear. Through the examination of a number of little-known details and discussion of the constituent materials in this chapter, a new understanding of the processes required to extract, manufacture and combine the constituent materials into the extant corpus of buildings, not hitherto seen in previous scholarship, is discussed in detail in the conclusion.

The surviving structures may be viewed as records of, and memorials to, the anonymous craftsmen and labourers who built them, as much as to the elite patrons who paid for them. Craftsmen working on the most prestigious commissions[5] had to move from one site to the next upon completion of a project. Possibly, vernacular structures in the larger urban context would have been built by local resident builders. The focus here is on the master craftsmen who were responsible for the majority of the surviving corpus of elite buildings. It was these individuals,[6] working at the highest register of craftsmanship, who set the formal and aesthetic tone for the builders of less prestigious structures across the region.[7]

Workshop Organization and Tools

During this time period, most of the raw materials necessary for building would have been transported to construction sites, often over considerable distances.[8] Consequently, the study of the working methods and mobility of craftsmen cannot be separated from an examination of the process of extraction and transportation of the materials required to build the extant structures. On top of that, production facilities, such as kilns and forges, would have

been built anew at each major site of construction, as the craftsmen moved around the region. The number of different processes, and the organization required to coordinate the various skilled craftsmen involved, attests to the complexity of the management of large-scale construction projects, and the skill of the masters responsible for overseeing them. There is still limited archaeological evidence upon which to form an understanding of the working methods of tile makers, or indeed any craftsmen working in Anatolia during the medieval period. An exception to the general lacunae is the small three-roomed rectangular workshop that was excavated by Arık (in 1986) at the Beyşehir Palace site (c. 632/1235) in southwest Anatolia. Located to the south of the palace complex, it was found to contain blacksmiths' tools, wasters, ash and glaze slag, along with the remains of forges, a kiln and a lime store.[9] This rare example of an industrial workshop on-site can be used as firm evidence for the presence of itinerant masters having worked in temporary workshops on major construction projects in the early part of the thirteenth century,[10] as a palace would not be the site of an ongoing production facility once completed. In the latter part of the twelfth century we can observe architectural use of limited numbers of glazed bowls, at the Mengücek Gazi Tomb in Kemah (c. 586/1190) and the Kamereddin Tomb in Divriği (592/1196-7),[11] as well as imported Kāshān tiles from Iran at the Kilij Arslān II Kiosk (c. 569/1174) in Konya. These imported examples indicate that there was no on-site production in the twelfth century, and that importation was the only way of sourcing glazed elements for use in an architectural context in the early period of the development of Islamic buildings in Anatolia.

The organization of the business of supplying and transporting materials remains poorly understood because of the lack of sources. Occasional brief passages in traveller's accounts give some insights into the working methods of medieval craftsmen in the Islamic world. Naṣīr-i Khusraw, a Persian poet and traveller writing in 1047, described seeing marble being cut with a toothless saw in Syria, worked with 'Mekkah sand' as an abrasive.[12] Writing somewhat later, the chronicler Ibn al-Athīr (d. 630/1233) mentions a large timber yard in Baghdad,[13] and it is likely that other major cities would have had similar stores and timber merchants. Such a facility would have bridged the gap between the harvesting and processing of the raw material on the one hand, and the supply of timber for the construction trade on the other.

Very few craftsmen's tools survive from the Saljūq period. A rare example of a plasterer's trowel is currently held in the Arkeoloji Müzesi in Sivas. It is likely to have been the type of tool used to apply a smooth finish-coat of plaster to walls (fig. 1). The rectangular body is made of fired clay, with a roughly formed handle and a smooth turquoise glazed underside.[14] The use of glaze on a tool is very unusual, but it would have allowed for the consistent creation of a very smooth surface, and would also have been easy to keep clean. This trowel exemplifies the wide diversity of uses of glaze. Alongside the more common use on vessels and architectural revetment, it demonstrates an entirely practical application of the medium, which has no decorative function whatsoever. The use of a turquoise glaze suggests that, alongside being the most common in the early period, it was most likely the cheapest and easiest to produce. There was a need for large numbers of tiles with tonal consistency, and turquoise glazed wares were the pottery of common use, being inexpensive and produced at a large number of sites. Therefore, it makes sense that turquoise was the most common glaze colour employed in architectural revetment as well.[15]

Fig. 1: Glazed terracotta plastering trowel, Arkeoloji Müzesi, Sivas © R. McClary

Muslim and Christian craftsmen

A craftsman's *nisba*[16] is rarely proof of where he trained,[17] or even came from, although it may be useful as secondary evidence when the stylistic elements suggest strong links with a certain region or city. As will be further discussed below, close stylistic and formal connections between the architecture of Iran and Anatolia demonstrates the movement of individuals trained in the brick-building and glazed-tile decorating traditions of the areas to the east. In addition, stylistic evidence and the signature of Muḥammad ibn Khawlān al-Dimashqī, on the north wall of the Citadel Mosque, also known as the Alaeddin Mosque, in Konya point to the introduction of Aleppine hardstone building techniques in the early thirteenth century.[18] There is no evidence of Syrian masons having worked in Anatolia prior to that date.[19]

Despite a dearth of names and mason's marks pertaining to Armenian craftsmen on the Islamic buildings of Anatolia,[20] the units of measurement used in both Islamic and Armenian architecture are comparable.[21] However, absence of evidence is not, in this case, evidence of absence: Armenians could still have been involved in the construction of stone buildings in the region. Most buildings feature only one craftsman's name, if any. Given the numerous similarities between contemporaneous Armenian church architecture, and the architecture commissioned by the Turco-Muslim elites of Anatolia, especially the tombs,[22] it is quite likely that Armenian-trained stone masons were involved. In addition, it is very unlikely that during the early period, the Turkic nomads would have had the requisite stone-working skills, and those with expertise in building would have come from a region with a long tradition of brick rather than stone construction. It is possible that Christian workers, both skilled and unskilled, were recruited and operated under the direction or fiduciary control of a Muslim *amīr*, or an architect, referred to by the Persian chronicler of the Rūm Saljūqs, Ibn Bībī, as *miʿmārān-i kār-dān*.[23] It remains to be seen whether or not the lack of Christian craftsmen's names on buildings was a result of their *dhimmī* status, as the guild system, site management and architectural design processes in Anatolia during the twelfth and thirteenth centuries remain clouded in uncertainty.[24]

A process of exchange was in place between the various architectural traditions in the region. One of the clearest examples of the transfer of motifs and techniques from what is generally considered the Islamic tradition into Armenian architecture can be seen at the church of St. Hovhannes Mkrtitch (St. John the Baptist), in Gandzasar.[25] Construction of the church started in 1216, and was completed by 1238.[26] The building has several identifiably Islamic elements on the interior and exterior, with the eastern façade of the church having two recesses crowned with polylobed arches featuring trefoil pendants (fig. 2). These are almost identical to the examples employed on wood *minbar* entrances of the twelfth century that may be found in mosques across Anatolia.[27] In addition, the exterior of the central drum section has *intaglio* patterns of split palmettes in rectilinear and curvilinear panels. The element of the building that can be most closely associated with earlier Islamic structures is the square-plan shallow

pyramid skylight inside, which is constructed entirely of *muqarnas* cells (fig. 2),[28] as *muqarnas* do not occur in Armenian architecture prior to the early thirteenth century. A similar *muqarnas* skylight survives in the south narthex (*gavit*) of the Church of the Holy Apostles in Ani, added in the early thirteenth century.[29] This feature, above all, indicates the direct involvement of itinerant Armenian masons in the construction of earlier stone-built structures with Turco-Muslim patrons,[30] the lack of epigraphic evidence notwithstanding. Moving from the study of the craftsmen, attention must turn to the study of the main constituent materials with which the surviving corpus of buildings were constructed, namely stone and brick. The detailed study of the materials can reveal information about the working methods of the craftsmen.

Fig. 2: St. Hovhannes Mkrtitch (St, John the Baptist) Church, Gandzazar (1216-1238) © R. McClary

Materials: Stone

Stone, primarily limestone or sandstone, along with smaller amounts of basalt and marble, was the primary building medium of construction in the Rūm Saljūq Sultanate and the other Turko-Muslim polities of the region.[31] This reflected the pre-existing tradition of lithic construction in the region, prior to the arrival of the Saljūqs and the Türkmen nomads, from the mid-eleventh century onwards. The dominance of the local material, in contrast to the limited use of brick, suggests that, initially at least, most of the craftsmen were locals, the vast majority of which were Christians.[32]

The technique of using a dressed-ashlar skin, with a rough inner surface to increase mortar adhesion, on either side of a rubble and mortar core was long established in the indigenous building traditions of Anatolia.[33] The same method was also employed to the south in northern Syria in both the pre-Islamic and Islamic periods. The stone buildings of the Rūm Saljūqs and other Turko-Muslim dynasties were built using the established techniques, with the exception of the stereotomic *muqarnas* hoods. Innovation was reserved for the incorporation of new modes of decoration, such as glazed tiles, and the form adapted to suit the different functional needs of the new patrons, for example in the construction of mosques and madrasas. The established structural elements, along with the innovative decorative motifs and forms, came together to create patterns and forms which became part of the architectural canon in late medieval Anatolia.

There are three primary phases in the stone-building process. The stone must be quarried and transported to the site, after which the stones are cut, before they are finally set. It may be assumed that cranes and pulleys would be needed to lift all but the smallest blocks from the ground. The cutting process required one set of tools, while the process of laying stones required another. For cutting, the tools required include; axes, gavels, chisels, mallets and handsaws, while the stone setters would have used hammers, large chisels, and tools for winding up blocks. The individual masons would have had their own square.[34] Al-Jazarī, the inventor and scholar who worked as chief engineer under the Artukids in Mardin, attests to the

use of plumb lines in the late twelfth century in his *Kitāb fī maʾrifat al-ḥiyal al-handasiyya* (Compendium of Science and Useful Practice in the making of Mechanical Devices).[35]

The different colours seen in sandstone are caused by variations in the types of inclusions. Grey results from clay, while red, brown and yellow are due to the presence of ferric oxides in the stone.[36] The softness of stone, due to higher water content when freshly quarried, makes it much easier to work, and as the stone dries it hardens. This is particularly the case with the volcanic tuff that was commonly used, especially in Kayseri.[37] The harsh winter weather in Anatolia precluded building all year. Aside from the inclement working conditions, the mortar would not set, and the moisture content in the freshly quarried stones, which made them easier to work, also made them too brittle to work if frozen.[38] The ashlars could be prepared with an axe or hammer, and fine grained sandstone and limestone can be cut with a toothed saw.[39]

Stone pattern design and execution

The Citadel Mosque in Divriği is the earliest surviving decorative portal attached to a Muslim building in Anatolia (fig. 3), and is securely dated, by the upper band of epigraphy, to 576/1180-81.[40] The mosque is rectangular, with the short side facing towards the *qibla.* The portal is built in a hybrid style that reflects the eclectic nature of the early phase of Islamic architecture in Anatolia. The mosque was built for the Mengüjekid ruler Sayf al-Dīn Shāhanshāh (r. c. 570-593/ c. 1175-97)[41] and the lintel features the signature of the craftsman in kufic script, Ḥasan (?) ibn Pīrūz (?) al-Marāghī.[42]

Fig. 3 – Citadel Mosque, Divriği (576/1180-81); portal © R. McClary

Fig. 4 – Citadel Mosque, Divriği; portal cross-section @ 130cm above top step © R.McClary

It has the largest number of incised construction lines of all the extant stone portals, and it appears to be the case that, over time, lines were incised less deeply (or not in a permanent manner), particularly in the period after the death of ʿIzz al-Dīn Kay Kāwūs I in 616/1219-20, the point at which a mature regional style of Islamic architecture can be seen to have emerged. The portal of the Citadel Mosque in Divriği has two noteworthy examples of construction lines. The rectilinear geometrical pattern in the top right corner of the door has clearly visible grid-lines (fig. 5). This was probably the first part of the decoration to be executed, as the top-left corner, which features the same pattern, has far fewer visible construction lines than the top-right corner does. It is likely that the craftsman, working on the blocks *in-situ*, had worked out the underlying design required for the execution of the pattern by the time he got to the other side.[43]

Fig. 5: Citadel Mosque portal, Divriği (576/1180-81); door jamb detail (Top) and portal lintel detail (Bottom) © R. McClary

In addition to the corner patterns, the bottom of the tympanum above the door and below the square panels with geometric patterns (which also feature visible construction lines) is a band of incisions which are the underlying design for a strip of decoration that was never completed. The pattern, based on circles, consists of two rows of wavy lines (fig. 5). The lack

of any finished pattern allows a rare glimpse into the underlying planning methods for the execution of patterns by the craftsmen responsible for one of the earliest decorative stone portals in Anatolia.

The square stone panels with geometric patterns in the tympanum above the door are similar to panels on two tombs in Nakhchivān City, the Yūsuf ibn Kutheyyir tomb (557/1162-3) and the Muʾmina Khātūn tomb (582/1186-7), but are executed in stone rather than brick. The surrounding arch and spandrels are constructed with stones cut to look like bricks (fig. 3). In addition, the spandrels feature glazed inserts.[44] The geometric patterns are much shallower than those on the rest of the corpus of surviving portals and are the only examples to have a flat rather than curved or V-incised surface. It is also the only mosque portal that has a lintel instead of a shallow arch over the door. It is by the close examination of the details of the surviving structures that small clues as to the working methods emerge. The mix of patterns, and even methods, developed in the brick-building tradition of Saljūq Iran, with materials and techniques employed in the indigenous lithic tradition of Anatolia make this portal unique. It represents the intersection point of the two traditions of east and west, indigenous and imported. As the cross-section shows (fig. 4), there are a number of features, such as the facet at 45 degrees, the engaged columns, and the use of *intaglio* rather than relief patterns, which make it an important structure in the development of a unique Anatolian aesthetic. It is with this portal that the master builder (*ustādh*) laid the groundwork for a number of later structures.

At the north edge of Divriği, below the citadel, is the Sitte Melik Tomb (592/1196-7).[45] The patterns on the portal of that tomb also feature a number of incised grid-lines. In addition, the surface of the pattern around the entrance has visible tooling marks (fig. 6). As well as providing the grid for geometrical strapwork interlace patterns, shallow surface incisions were also used to plan the carving of *muqarnas* cells into flat surfaces. Surviving examples of construction lines can be seen over the flanking niches of the outer enclosure portal of the Mama Khātūn Tomb in Tercan (c. 596/1200),[46] (fig. 7).

Fig. 6: Sitte Melik Tomb, Divriği (592/1196-7); portal door jamb detail © R. McClary

Fig. 7: Mama Khātūn Tomb, Tercan (c. 596/1200); upper band of *muqarnas* above left niche © R. McClary

The style of funerary stelae developed by the stone masons in Ahlat emerged in the late twelfth century, following the demise of the ruling Sökmenid dynasty.[47] A dwindling number of elite patrons led to the subsequent decline in architectural patronage that had been thriving there for the previous twenty years.[48] Oya Pancaroğlu has argued convincingly that Ahlat was probably the place where *muqarnas* cells were first translated into stone in Anatolia, and introduced into the architecture of the region.[49] A surviving tombstone, located in the southwest corner of the large graveyard outside Ahlat, features the same form of *muqarnas* cells and incised construction lines as seen in the later tomb portals at Tercan and Divriği. There is a strong stylistic continuity in the form of the tombstones, of which several thousand survive, with dates ranging from the late twelfth century through to the fourteenth century.[50] The incised construction lines are clearly visible (fig. 8), and the form and technique can be related to that of the bands of *muqarnas* cells over the niches flanking the portal in Tercan. The *nisba* of the craftsman of the earliest surviving architectural stone *muqarnas*, at Divriği and Aksaray, is *al-Khilātī,* which, along with the lithic evidence, gives further support to the argument that Ahlat (Ar. *Khilāt*) was where that the carving of *muqarnas* cells in stone developed in Anatolia.[51]

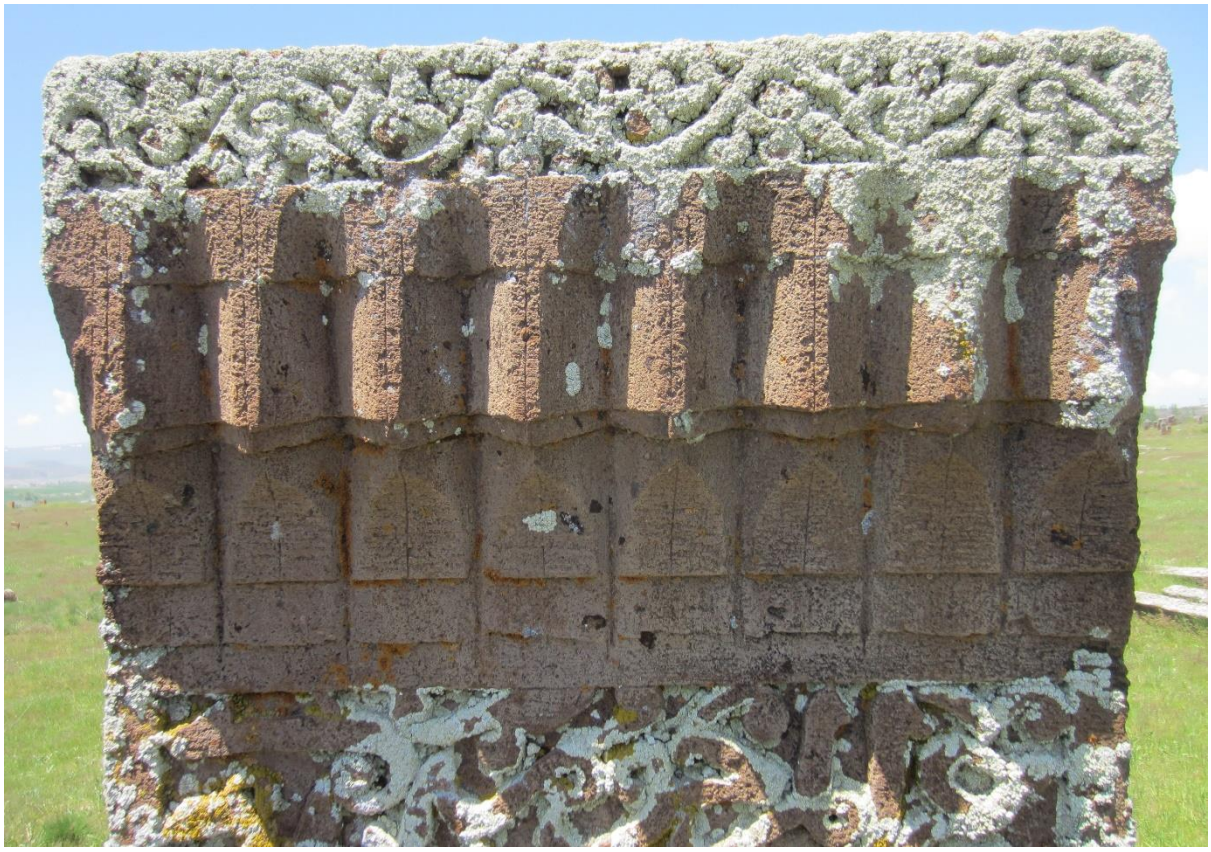

Fig. 8: Upper portion of a tombstone in the southwest corner of Ahlat graveyard (late twelfth century) © R. McClary

The late twelfth century represents a brief moment in time when the design process for patterns and forms that were to develop and proliferate in the following century was laid bare for posterity. Subsequently the planning was hidden from the eyes of later observers. It is only through extremely close observation of the material that it is possible to discern the tool marks that reveal the working processes of the medieval craftsmen. The method of incising construction lines used by stone carvers was also employed by wood carvers when laying out their geometric patterns.[52] Little is known about the degree of trade specialisation during the late medieval period, but Rogers has suggested that the same people are not thought to have worked on different materials.[53] That said, such similarities of technique, as well as the use of chisels, axes and saws to work both stone and wood, may go some way in explaining why the name carved onto the stone-built Alay Han near Aksaray (c. late twelfth century) includes the epithet *al-najjār* (the woodcarver).[54] It may be the case that said individual had taken on a supervisory role, but he might well have been capable of working in both wood and stone, suggesting a less media-specific division of labour than previously thought. It is not just the external details of buildings that reveal information about working methods and the transfer of techniques from one architectural tradition to another, there are occasional glimpses of internal methods as well.

Iron cramps

The use of large iron cramps to hold marble blocks together was a structural technique employed in the earlier Byzantine building tradition.[55] As it is an internal system, in order to see the cramps, a building has to have experienced extensive fabric loss of physical deterioration. The only visible example in the Islamic context, or dating from the period of Islamic rule in Anatolia, is to be found in Sivas, on the lower right-hand side of the entrance of

the Gök Madrasa (670/1271-2).[56] The cramp is secured by being set into an oversized hole in the top of each block, with the iron cramp then encased in lead. The Sivas example is only visible because sections of the marble facing block have come away, due to water entering through cracks and either freezing and forcing the stone away, or the iron rusting and the resultant expansion forcing the marble away (fig. 9). Like the use of wood tie-beams, particularly common in Akşehir,[57] techniques developed in the Roman-Byzantine tradition of building can be seen to have continued long after the external aesthetic for which they were originally developed had fallen out of use.

Fig. 9: Gök Madrasa portal, Sivas (670/1271-2); iron cramp © R. McClary

Muqarnas hoods

The *muqarnas* hood is the most visually striking and technically challenging aspect of the portals in Anatolia. It is a motif that, although occasionally used by other contemporaneous dynasties, and carried on under various later ones, came to be associated primarily with the Rūm Saljūq architectural aesthetic in the thirteenth century. There is evidence that the same craftsmen worked for both Rūm Saljūq and Mengüjekid royal patrons in the last decade of the twelfth century,[58] but by the early thirteenth century such an approach was less common. The absence of the use of *muqarnas* hoods for the primary portals or the *mihrab* of the monumental Mengüjekid mosque and hospital complex in Divriği, completed in 626/1228-9,[59] suggests that it was increasingly recognised as a more specifically Rūm Saljūq, rather than a generally Turco-Muslim motif in Anatolia. Through the course of the thirteenth century the form can be seen to have proliferated across the expansive Rūm Saljūq Sultanate.

The two earliest *muqarnas* hood portals to survive, at the Saljūqid Alay Han near Aksaray and the Mengüjekid Sitte Melik Tomb in Divriği,[60] over 450km apart, bear the signature of the same Tūtbeg ibn Bahrām al-Khilāṭī,[61] showing both the mobility and the diverse patronage of craftsmen at the time. The Alay Han is thought to date from late in the rule of the Rūm Saljūq Sulṭān Kilij Arslān II, probably somewhere around 586/1190 according to Pancaroğlu, while the tomb has a *terminus ante quem* of 593/1196-7, based on the epigraphic band around the top.[62] The Divriği tomb was built for the same patron as the Divriği Citadel Mosque, Sayf al-Dīn Shāhanshāh (r. 570-593/1175-97).[63] Unlike all the other portals in the corpus, it does not have a *cavetto* frame, featuring instead a stepped recess with a patterned edge. Neither of the portals have flanking niches, but the Alay Han portal has a low-relief carving of a pair of affronted lions that share a single forward-looking head at the base of the *muqarnas* hood. This symbol of royal authority is also seen on the portals of the Çifte Madrasa in Kayseri (602/1205-6), and the ʿIzz al-Dīn Kay Kāwūs Hospital in Sivas (614/1217-18).

Having seen a number of details in the central and eastern parts of Anatolia, attention now turns to the study of the use of imported forms and patterns on two marble portals in Konya.

An Aleppine motif writ large: Stereotomic strapwork

The bi-chrome marble blocks which decorate the arch and spandrels of the portal (c. 616/1219-20), set into the north enclosure wall of the Citadel Mosque in Konya,[64] are examples of complex structural stereotomy, with the stones forming the interlace pattern being fully bonded with the masonry of the building[65] (fig. 10). The geometric interlace is incised with two parallel sets of three lines across polygonal stones that add a sense of relief and accentuate the dynamism of the entire composition. The closest parallel is to be found in the decoration of the coeval *miḥrāb* surrounds in a number of the Ayyūbid madrasas in Aleppo, the Madrasa al-Sulṭāniyya (619/1223) being the most similar (fig. 10). Unlike many of the other Syrian examples,[66] it also has small *ajouré* bosses in the upper corners in the manner of the Karatay Madrasa portal (c. 617/1220), located just to the north of the Konya citadel.[67]

Fig. 10: Citadel Mosque, Konya; North portal (L) Madrasa al-Sulṭāniyya, Aleppo (R) © R. McClary

The courtyard *īwān*[68] of the Mashhad al-Ḥusayn in Aleppo (c. 585/1189) is thought to be the earliest example of strapwork stereotomy.[69] Scott Redford has argued that the spandrel decoration of the marble portals in Konya represents the monumentalising and externalising of a form previously reserved for the *miḥrāb.*[70] The Mashhad al-Ḥusayn *īwān* decoration suggests that the use of the motif in the *miḥrāb* context may have been the miniaturisation and internalising of a previously monumental external form.[71] The lack of projection and *muqarnas* on the Mashhad al-Ḥusayn *īwān* is similar to the form of the Citadel Mosque portal in Konya. In contrast, the large epigraphic panel along the top and projection above the rest of the façade is in the manner of the Karatay Madrasa portal in Konya.[72]

Although the closest parallels for the interlace patterns are to be found in the architecture of Aleppo, there are several monumental examples of lithic interlace to be found in Mesopotamia. The pattern employed on the Konya portals is of a kind that has been described as the 'Syrian knot', although the motif rapidly became dispersed across a wider region.[73] The city of al-ʿAmadiyya, about 160km northeast of Mosul, was within the domain

of the Zangid-turned-independent ruler Badr al-Dīn Luʾluʾ (d. 657/1259), a man of Armenian servile origins, to whom the surviving gate is attributed.[74] The Bāb al-Mawṣil in al-ʿAmadiyya (c. early thirteenth century) features marble interlace in the spandrels of the arch, but the decoration is in bas-relief and monochrome.[75] The overlapping semi-circle pattern on the arch voussoirs, which form the bodies of the two dragons, is the most similar element of the composition.[76]

Another contemporary of the Konya structures was the Bāb al-Tilism (Talisman gate) in Baghdad, dated to 618/1221.[77] Although it was set into a brick tower that formed part of the city wall, the portal itself consisted of marble carved spandrels, joggled voussoirs and columns. The bas-relief interlace was more organic and free-flowing than the other examples discussed thus far, and clearly formed the bodies of two dragons that flanked a seated ruler, probably Caliph al-Nāṣir, at the apex of the arch.[78] It was the only known example of its kind in Baghdad, and demonstrates the wide-ranging geographical scope, if limited number, of this broad type of portal in the first two decades of the thirteenth century. There were extensive political connections between the Caliph in Baghdad and the Sultan in Konya at this time, including the Rūm Saljūq Sultan ʿIzz al-Dīn Kay Kāwūs I's membership of the Caliph's *futuwwa* movement.[79] The corners of the al-ʿAmadiyya gate spandrels are decorated with a figural relief of a dragon-slayer with a sword. In Mesopotamia, figural elements replace the rectilinear interlace. It is tempting to think that on the religious buildings of Konya and Aleppo, the aniconic rectilinear and curvilinear motifs were employed by the builders to act as abstracted symbols for the apotropaic depiction of victory over evil, a theme so clearly displayed in figural form in the contemporary secular city gates in al-ʿAmadiyya and Baghdad. The overlapping semi-circles on the arch, while clearly representing the body of the dragon on the secular city gates, alludes to such a form in its use in a religious context, and suggests an attempt to conflate orthodoxy and apotropaic protection of religious buildings.[80]

The introduction of a Crusader motif: Elbow brackets

Following the Latin occupation of Jerusalem, elements of Crusader stone-carving motifs entered the Islamic architectural tradition following the re-conquest of the city by the Ayyūbids in 583/1187. The marble elbow brackets on the Citadel Mosque portal in Konya are a slightly simplified copy of the ones seen on the north façade of the al-Aqṣā Mosque in Jerusalem (fig. 11).[81] The latter building had been remodelled and used as a palace by the Knights Templars in the twelfth century. Following the re-consecration of the building as a mosque in 583/1187, the north porch was rebuilt in 614/1217-18 under the patronage of Ṣalāḥ al-Dīn's nephew al-Malik al-Muʿaẓẓam.[82] The brackets, referred to as angle shafts by Hamilton, are cut from single blocks of medium-hard limestone, and are incorporated into the north porch.[83] The conspicuous appropriation of an identifiable aesthetic of the defeated Christians,[84] on the most prestigious mosque in Jerusalem, and second holiest in Islam, suggests that it may have been intended as a sign of the victory of Islam and the subjugation of Christianity.[85] Following this logic, it seems quite possible that the Rūm Saljūq Sultan ʿIzz al-Dīn Kay Kāwūs I (r. 608-616 / 1211-1219) was attempting to make a similar political statement through the prominent use of an array of Ayyūbid decorative elements on the portal of the most prestigious mosque in the Rūm Saljūq Sultanate.[86] This use of visual culture was but one part of the process of creating and supporting an imperial identity, alongside coinage and the expansion of commercial activity.

Fig. 11: Elbow brackets: Citadel Mosque, Konya (L) al-Aqṣā Mosque, Jerusalem (R) © R. McClary

The hiring of Syrian craftsmen, rather than local or Iranian ones, resulted in the appropriation of what was a specifically Aleppine Ayyūbid aesthetic. It was introduced into Konya, the nexus of Rūm Saljūq power, and the newly synthesised aesthetic was projected across the city in what could be viewed as a symbolic appropriation of the Ayyūbids and their lands. The restriction of this style to Konya resulted in the creation of a specific visual identity for the capital. The use of craftsmen building in the style of the established Iranian aesthetic for the major commission of ʿIzz al-Dīn Kay Kāwūs I, at the hospital in Sivas, may be seen as having served a similar function, on a much grander scale,[87] in regard to the former lands of the Great Saljūqs in Greater Iran. This use of architecture as a physical cypher for universal dominion is reflected in the Sulṭānic titulature of the period, which also tends towards claims of universal dominion.[88]

The majority of surviving structures built during the period of study are constructed of stone, but a number of the earliest tombs, as well as much of the hospital in Sivas (614/1217-18) and most of the surviving minarets are built of brick. Given the preponderance for brick construction in Iran, and the effect of forms developed there in brick on the later lithic architectural aesthetic in Anatolia, it is to that material that the focus now turns.

Materials: Brick

Although the west of Anatolia had a long tradition of brick construction during the period of Byzantine rule, the brick-built structures dating from after the Turko-Muslim conquest of the region are all built in the Iranian style. There are numerous stylistic connections between the Islamic architecture of Iran and Anatolia during the period of study, in terms of form and glazed tile decoration. However, it is the metrological similarities which reveal that it was craftsmen moving from Iran into Anatolia that were responsible for the aesthetic, rather than the often nebulous ‘influence’ of Iranian architecture that led to the erection of Persianate brick buildings in Anatolia.

There is considerable variation in the size of Byzantine bricks, with the standard brick being between 32cm to 36cm square and a thickness range of 3.5cm to 5cm.[89] The bricks used in the buildings of the Islamic period across Iran and Central Asia also have a wide variation in size, with the measured samples having a range of 18cm to 25cm per side and a thickness of 3.8cm to 6cm. However, the bricks employed in the late medieval Islamic architecture of

Anatolia are about 20cm square and closer to 5cm thick on average, making the majority of the surviving examples smaller and thicker than the Byzantine bricks. Given the stylistic similarities between much of the architecture of Anatolia and that of northwestern Iran, it is to be expected that the size of brick used would also be quite similar. Bricks dated to the Great Saljūq period have been excavated at Gurgān, on the southeast coast of the Caspian Sea, which measure 20cm square and 4cm thick.[90] In addition, the Gunbad-i Qābūs in Gurgān (397/1007) has bricks which measure 20.8cm square and 4.7cm thick.[91] Such close correlation between the sizes of bricks used in Iran and Anatolia, along with the formal and decorative similarities of the structures, and the use of glaze, all point towards the conclusion that the majority of the brick workers in Anatolia[92] were migrants from Greater Iran, trained in the Iranian architectural tradition.

The literature on medieval metrology includes a number of seemingly impossibly precise definitions for some of the units used by craftsmen in the medieval period.[93] However, there are a number of factors that suggest a more haphazard and site- or craftsman-specific approach was taken in regard to the units of measurement used by the craftsmen working in medieval Anatolia. These include the irregular shrinkage rate of baked bricks, the lack of standardised rule sizes, and irregularities in the plans and decorative details of the extant structures. The *Kitāb fī maʾrifat al-ḥiyal al-handasiyya*, written in Diyarbakır (Āmid) in the late-twelfth century by Ibn al-Razzāz al-Jazarī,[94] and described as the earliest manual of engineering practice,[95] gives three measurements. It states that a *shibr* is half a *dhirāʿ* (cubit),[96] or about 25 centimetres.[97] This distance, which roughly corresponds to the span of a human hand, is very close to the width of the average brick, plus one rising joint of mortar. It appears to be the case that the *shibr* was the basic unit of measurement used by the brick builders, as well as engineers such as al-Jazarī, working in the region. Another unit given by al-Jazarī is the *iṣbaʿ maftūḥ* (the length of a finger) a distance equivalent to about four centimetres.[98] This unit of measurement is very similar to the average thickness of the bricks used in Anatolia, and suggests that the two basic units, for the width and the height of bricks, were standardised across a wide geographic area, from Central Asia to western Anatolia.

Iranian architecture in exile: The Malatya Great Mosque

The Great Mosque in Malatya (c. 645/1247)[99] features a number of brick structural forms and decorative elements that demonstrate the northwest Iranian origin of the craftsmen who built it.[100] In the typically syncretic style of Rūm Saljūq architecture, the stone (but not marble) west portal has a similar, if rather more crude, version of the two bi-chrome stereotomic portals in Konya, while the *maqṣūra* dome is almost entirely Iranian in style. It features wide, brick-built, load-bearing *muqarnas* cells that effect the transition from the square structure to the round dome (fig. 12). They form the lower section of the squinches of the *maqṣūra* dome, and appear to be the last examples of structural brick *muqarnas* in Anatolia.[101] They are very similar to those found in northwestern Iranian mosques, such as the Masjid-i Jāmiʿ in Marand,[102] a mosque that has been categorised by Robert Hillenbrand as forming a distant part of the Qazvīnī style of architecture.[103] The similarities between the Marand and Malatya mosques, as well as other examples in Iṣfahān and Qazvīn, demonstrates the mobility of craftsmen, who appear to have travelled from the former Ildegüzid and Great Saljūq lands to the east. The Malatya dome appears to be the only example of this type of brick *muqarnas* dome support to survive in Anatolia.[104] Similar, if smaller, structural brick *muqarnas* cells can be seen on the balcony of the minaret attached to the Great Mosque in Sivas in 609/1212-13[105] and on an even smaller scale in the two niches in the north *īwān* of the nearby hospital, founded by ʿIzz al-Dīn Kay Kāwūs I in 614/1217-18. Both of these structures have been associated with a craftsmen named Aḥmad Ibn Abī Bakr al-Marandī,[106] so the structural evidence for the

mobility of craftsmen is supported by the *nisba* of a craftsman known to have been working the region. The architectural syncretism, consisting of indigenous and imported lithic elements, integrated with brick-built forms and glazed decoration developed in Greater Iran, shows the presence of a wide range of craftsmen from both within and without Anatolia having worked on the surviving corpus of buildings.

Fig. 12 – Malatya Great Mosque (645/1247); large structural brick *muqarnas* cells in *maqṣūra* dome squinches © R. McClary

Role division hypotheses

In order to refine the understanding of the working methods and mobility of craftsmen in medieval Anatolia, analysis of the different processes involved in the extraction, manufacture and combination of building materials into finished structures can been divided into seven categories. These correspond to the six main materials: stone; brick; glaze; mortar; timber and iron, along with one miscellaneous group of non-media specific roles. This has resulted in the identification of 120 roles,[107] requiring different skill levels, with the only obvious overlap across materials being their transportation. Within each group, the same individual may well have performed many different roles, and the precise details of the division of roles will probably never be known. What can be hypothesised is the number of distinct, skilled roles required for the successful completion of each aspect of the construction process, from resource extraction to project completion. For stone construction there were six discernible roles (Table 1), for brick, five (Table 2), while glazed tiles required seven different skilled roles (Table 3). Mortar and plaster also required six (Table 4), assuming that brick workers and stone setters would be responsible for the final combination of their respective materials with the bonding mortar. Of the nineteen basic roles involved in the architectural use of timber (Table 5), eight were skilled or semi-skilled roles, while the extraction and

manipulation of iron required four skilled roles (Table 6). Regarding the miscellaneous and non-media specific tasks (Table 7), such as site management, food preparation, and treatment of injuries, seven of the eight roles would have required some considerable degree of skill. So, of the total of 120 roles, 43 (or about one-third) may be deemed to have required significant levels of training and experience. Such a ratio may suggest a division of the workforce into three fairly equal sections; labourers, apprentices with varying levels of experience, and fully-trained craftsmen, of which only a few would be masters in their field.

It may be assumed that for the most part, the labourers were recruited locally, from the predominantly Christian population.[108] With the exception of the few named master masons who were working in a very similar manner to, and based on their *nisba*s had moved from, Ayyūbid-ruled Syria, the stone masons were largely Anatolian, and probably predominantly Armenian and Georgian. Such a view is based on the formal and decorative similarities between the surviving churches and the stone-built Islamic architecture of the period.[109] The same is likely to have been the case for the blacksmiths and many of the carpenters. In contrast, it is likely that the majority of the higher-skilled individuals, especially those working with baked bricks and glazed tiles, were immigrants to Anatolia from Iran, and possibly even Central Asia, especially in the late twelfth and early thirteenth centuries.

Stone Construction	**Unskilled**	**Semi-Skilled**	**Skilled**
Quarry stone		X	
Select stone			X
Rough shaping and dressing		X	
Transport building stones and rubble	X		
Site levelling (under supervision)	X		
Run string lines and survey site			X
Dig foundations	X		
Finish dress ashlars			X
Cut mouldings, voussoirs and patterns			X
Design and create stereotomic *muqarnas* hoods			X
Carve figural sculptural elements			X
Carve marble epigraphic panels			X
Install ashlars			X
Place rubble and mortar infill	X		
Build, install and operate lifting machines		X	
Erect scaffolding		X	
Move stone and mortar around site	X		

Table 1 – Processes involved in stone construction

Brick Production and Construction	Unskilled	Semi-Skilled	Skilled
Calculate the number of bricks required for the building			X
Select clay			X
Quarry clay	X		
Collect and sieve sand	X		
Transport raw materials to kiln site	X		
Puddle clay with water and let stand		X	
Mix sand into clay at the correct ratio			X
Fill wood or metal brick moulds		X	
Lay moulds out in the sun to air dry	X		
Gather and transport fuel for kiln	X		
Load bricks into kiln		X	
Fuel kiln and ensure temperature reaches 800°C to 900°C			X
Determine point at which the bricks are successfully fired			X
Unload kiln	X		
Grade bricks			X
Transport bricks to site (if kiln is off-site)	X		
Custom-cut corner, detail and Kufic letter bricks			X
Distribute bricks around building site and up scaffolding	X		
Lay bricks in courses between beds of mortar			X

Table 2 – Processes involved in the production and use of bricks

Glazed Tile Production	Unskilled	Semi-Skilled	Skilled
Mine ores		X	
Transport ores	X		
Smelt various metals for glaze			X
Quarry clay	X		
Transport clay	X		
Prepare clay for moulds		X	
Fill moulds and form tiles		X	
Gather soda plants	X		
Burn soda plants		X	
Prepare glaze mixture			X
Gather fuel for kiln	X		
Load kiln			X
Add fuel to kiln	X		
Manage temperature of kiln and length of firing time			X
Paint underglaze designs			X
Apply glaze			X
Cut tiles			X
Transport tiles	X		
Plan overall design			X
Prepare surface		X	
Install tiles			X

Table 3 – Processes involved in the production and installation of glazed elements

Mortar Production	**Unskilled**	**Semi-Skilled**	**Skilled**
Quarry limestone and gypsum		X	
Gather aggregates	X		
Sieve and grade aggregates		X	
Transport materials to site	X		
Burn lime		X	
Dig pits	X		
Prepare mortar and leave to slake			X
Rehydrate mortar		X	
Add aggregates as binders and pozzolans		X	
Move mortar around site and deliver to craftsmen	X		
Use mortar for setting bricks into walls and vaults			X
Incise patterns in the mortar joints			X
Use mortar for rubble infill and setting ashlars			X
Apply to vertical surfaces and domes as finish layer			X
Paint external surfaces with geometric patterns			X
Make stucco moulds			X
Fill stucco moulds		X	
Install stucco panels			X
Carve epigraphic inscriptions			X

Table 4 – Processes involved in the production and installation of mortar

Timber Construction and Woodworking	**Unskilled**	**Semi-Skilled**	**Skilled**
Determine the amount of timber required			X
Select the trees			X
Fell the trees			X
Limb the trees	X		
Gather poles for scaffolding	X		
Rough-cut timber for transport		X	
Transport timber	X		
Stack timber for drying	X		
Cut timbers with two-man saw			X
Shape and notch timbers with adze and axe			X
Precision-cut sections for doors, shutters and *minbar*s			X
Carve patterns and calligraphy into panels			X
Cut and assemble *kundakiri* sections			X
Move timbers around construction site	X		
Install tie beams into walls		X	
Rough cut wood for scaffold planks, bracing and centring	X		
Erect arch vault centring and scaffolding		X	
Build and erect cranes and other lifting machines			X
Design and install roofing systems			X

Table 5 – Processes involved in timber construction and woodworking

Iron Production and Use	Unskilled	Semi-Skilled	Skilled
Mine iron ore		X	
Transport iron ore	X		
Smelt the ore to produce iron			X
Transport ingots	X		
Gather fuel for forge	X		
Load fuel and operate bellows		X	
Determine and maintain forge temperature			X
Forge and shape iron objects			X
Temper iron objects			X
Make clay models of items			X
Make mould of item			X
Cast and finish item			X
Fabricate component parts			X
Incise patterns into the finished object			X
Produce steel for tool edges			X
Sharpen tools		X	
Move metal objects around site	X		

Table 6 – Processes involved in the production of iron objects

Miscellaneous Site Roles	Unskilled	Semi-Skilled	Skilled
Fiduciary management – pay wages and suppliers			X
Site Management – co-ordinating different trades			X
Chef – food preparation		X	
Leatherworker – repair leather gloves and aprons			
Scribe – prepare contracts and lay out epigraphy			X
Doctor – treat worksite injuries			X
Deliver water for drinking and mortar production	X		
Remove waste materials form site	X		

Table 7 - Miscellaneous site roles

Conclusion

In late medieval Anatolia a significant methodological change regarding the execution of stone patterns took place. This change demonstrates the dynamic and innovative development in techniques and styles that was underway in the region during this time period. The external decorative innovations of many of the buildings can be seen, on occasion, to mask internal structural conservatism. The structural methods exhibit a strong sense of continuity from the earlier Christian architecture of the region. In order to accommodate the different functional and aesthetic needs of the ruling Muslim patrons and the growing Muslim community a number of spatial and decorative changes were made. At the same time, new materials (such as turquoise-glazed tiles) and new motifs (such as *muqarnas* cells) executed in wood, brick and stone, were introduced.

The combination of different materials and traditions in the same building, seen across Anatolia, in places such as Akşehir in the west, Sivas in the centre and Erzurum in the east, demonstrates the eclectic and universal character of the construction business in Anatolia during the late twelfth and early thirteenth centuries. Stone masons and brick workers, Christians and Muslims, indigenous and immigrant, all worked together on a wide range of structures for the various Muslim dynasties across the region. By the early decades of the thirteenth century these craftsmen had created a new and uniquely Anatolian architectural aesthetic.

Richard Piran McClary, The University of Edinburgh, 2015

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[1] Buildings built under Muslim patronage or for the purposes of prayer or religious study. The corpus consists of tombs, mosques and madrasas, as well as the commercial infrastructure built by the Muslim ruling elite, including caravanserais, bridges and markets. Within the broad term of Islamic architecture may also be included the hospitals, palaces and mural fortifications erected during the period of Muslim rule.

[2] Examples include the Great Mosque minaret (609/1212-13) and the ʿIzz al-Dīn Kay Kāwūs Hospital (614/1217-18) in Sivas as well as the Mengücek Gazi Tomb in Kemah (c. 1190).

[3] The focus is on buildings erected between c. 1170 and 1220 and primarily involves buildings with Rūm Saljūq connections because the surviving corpus of buildings is primarily associated with their patronage.

[4] The largely lithic medium and several elements of decoration can be seen draw from the Armenian architectural tradition. See McClary, *Rūm Saljūq Architecture*, pp. 259-261. In contrast, the use of exposed timber beams and *opus mixtum* construction, as seen in the mosques of Akşehir, shows clear links to Byzantine traditions of building. See ibid. pp.240-242.

[5] The most prestigious commissions primarily consisted of expensive projects with royal patrons and which involved a wide variety of materials and extensive ornamentation.

[6] Although few of the individuals are named, one example is Aḥmad ibn Abī Bakr al-Marandī, who worked in Sivas, Niksar and Tokat in the first three decades of the thirteenth century. See McClary, *Rūm Saljūq Architecture,* p.130 and 356 for more details of his work.

[7] When studying the pre-Mongol architecture of Anatolia, the focus is inevitably on the smallest proportion of structures, namely those with elite patrons, as they tend to be what has survived. These were the structures that set the tone for the wider corpus, most of which does not survive.

[8] Redford, *Just landscape in medieval Anatolia,* p.83 cites a contemporary source, by Ibn Saʿīd, which refers to floating pine lumber down the river from forests located near Amasya northward to Sinop, for use in building the arsenal.

[9] Arık, *Tiles in Anatolian Seljuk Palaces*, pp.496-497.

[10] Ibid. p.498.

[11] See Meinecke, *Feyancedekorationen seldschukischer*, Vol.2, p.113, fig.21 for a drawing showing the location of the bowls.

[12] Greenhalgh, *Marble Past, Marble Present*, p.137, citing Le Strange, G. (trans. and ed.), *Nasir-i Khusrau. Diary of a journey through Syria and Palestine,* (London: Committee of the Palestine Exploration Fund, 1893) p.132.
[13] Richards, *The Chronicle of Ibn al-Athīr*, p.342. The translation of Ibn al-Athīr's *al-Kamil fi l-Ta'rikh* states that a fire in the store yards in 583/1187 destroyed large stocks of timber.
[14] The tool measures c. 25cm x 10cm on the base.
[15] Tonghini, *Qal'at Ja'bar pottery*, p.70 adds that the turquoise monochrome wares were not particularly sophisticated, being cheaper and inferior to other glazed table wares.
[16] Arabic for 'attribution'. Defined in Sourdel and Sourdel-Thomine, *A Glossary of Islam,* p.127 as an element of a personal name that indicates one of the following: birthplace of a person or his family, place of residence, vocation, tribe or school of law.
[17] Rogers, *Patronage in Seljuk Architecture*, p.446. He goes on to state that mason's marks are an equally unreliable index. Snelders, *Identity and Christian-Muslim Interaction*, p.91 states that *nisba* may refer to a technique or style associated with a city, rather than necessarily indicating the place of birth or family origins.
[18] See Redford, *The Alaeddin Mosque*, pp. 56 and 73
[19] Abū ʿAlī al-Halabī ibn al-Kattanī, presumably from Syria, based on his *nisba,* worked on the walls of Sinop in 611/1215, but there is nothing distinctively Syrian or Aleppine about the work he did. See Redford, *Sinop in the summer of 1215*, p.131.
[20] Rogers, *Art and Architecture in Anatolia*, p.966. Ghazarian and Ousterhout, *A Muqarnas Drawing,* p.145 notes the presence of a named Armenian master, Yovhanes, on the incised lines used to lay out a *muqarnas* vault on the Asvantsankal Monastery in Armenia of 1244.
[21] Blessing, *Rebuilding Anatolia*, p.103, citing Laor-Sirak, *The Role of Armenians*, pp.173-4.
[22] An example being the Mama Khātūn tomb (c. 1200) in Tercan, near Erzincan (Lat: 39º 46' 40" N Lon: 040º 23' 11" E).
[23] Yalman, *Building the Sultanante of Rum*, p.143.
[24] The division of roles in the upper echelon of the construction business remains unclear. See Rogers, *Patronage in Seljuk Architecture*, especially pp.296-367 and pp.400-418 for a good attempt to determine what can be known from the limited sources. See Snelders, *Identity and Christian-Muslim Interaction*, pp.90-92 for details of mixed Muslim/Christian workshops in the Mosul area during the period of study.
[25] The church is located c. 40km North-Northwest of Stepanakert, in the disputed territory of Nagorno-Karabakh.
[26] Mkrtchyan, *Treasures of Artsakh-Karabagh*, p.123. Eastmond, *Art and Identity*, p.92 states that the church was founded by the Christian Armenian king of Khachen, Ḥasan Jalāl Dawla / Haykaz (r.1214-1261).
[27] A similar motif, in stone, can be seen on arches in the courtyard of the Zinciriye Madrasa in Diyarbakır, built in the late twelfth century.
[28] In addition, the internal walls flanking the altar have steps running up the side, in the manner of those up to the entrance of the Quraysh Baba Tomb near Sinanpaşa, Afyon (c. 606/1209-10), located at Lat: 38º 45' 47" N Lon: 030º 24' 09" E. The underside of each step has been carved out to form a single *muqarnas* cell.
[29] Eastmond, *Art and Identity*, pp.92-3 states that Ani was liberated from Muslim rule by the Mqargrdzeli family in 1199. Their court was the most mixed of all the dynasties in eastern Anatolia, as they were Kurds who married into Armenian, Georgian and Saljūq families. For details of the design and construction of a similar vault at the Asvatsankal Monestary near Yerevan see Ghazarian and Ousterhout, *A Muqarnas Drawing,* especially pp.146-150.
[30] A similar *muqarnas* roof can be seen in the Great Mosque of Erzurum (late twelfth century).
[31] The surviving Dānishmendid structures, primarily located in in Sivas, Kayseri and Niksar, are almost exclusively stone-built.

[32] There was a wide array of different Christian denominations in the region at the time, including Syrian Orthodox, Greek, Armenian and Georgian. It is likely that craftsmen from a number of different denominations would have worked for the new rulers on their increasingly large number of architectural commissions.
[33] See Ousterhout, *Master Builders of Byzantium,* pp169-179 for details of the Byzantine methods of wall construction.
[34] Knoop and Jones, *The Mediaeval Mason,* p.54. The authors draw primarily on European sources, but the techniques and tools used for stone and brick construction remained basically unchanged from the Roman period until the nineteenth century.
[35] Hill, *The Book of Knowledge*, p.278.
[36] Clifton-Taylor, *The Pattern of English Building*, p.58 and p.110.
[37] Rogers, *Patronage in Seljuk Architecture*, p.439.
[38] Knoop and Jones, *The Mediaeval Mason*, pp.118-119.
[39] Ibid. pp.77-78.
[40] *RCEA*, Vol. 8, p.111. Located at: Lat: 39º 22' 32" N Lon: 038º 07' 24" E.
[41] Bosworth, *The New Islamic Dynasties*, p.217.
[42] Pancaroğlu, *The House of Mengüjek*, p.32. The Kufic inscription as it appears on the building, which begins with 'the builder is the master' includes an extra letter, a *lām* instead of an *alif* at the beginning of *ustādh* and a number of non-standard breaks between letters, resulting in isolated medial forms appearing in the text. See McClary, *Rūm Saljuq Architecture*, p.39 for the Arabic text as displayed on the portal.
[43] A reduced scale set of incised lines, used for the planning of a *muqarnas* vault, and now lost, was found on the south façade of the *gavit* of the Asvatsankal Monastery in Armenia and published in Ghazarian and Ousterhout, *A Muqarnas Drawing*. The authors cite it as evidence for the use of architectural drawings in the thirteenth century (ibid, p.144). However, as it also contained construction lines and is on the building, it appears to be closer to the examples of on-site design seen in the pattern and *muqarnas* cell designs discussed in this chapter, rather than evidence for the widespread use of architectural drawing in the architecture of the late medieval period.
[44] The nearby Kamereddin Tomb (592/1196), at the bottom of the citadel hill, is another rare example of stone and glazed elements being combined. In that case there is a band of shallow circular recesses around the top of the wall into which glazed bowls, rather than architectural tiles, were set.
[45] Located at: Lat: 39º 22' 25" N Lon: 038º 07' 09" E. See Önkal, *Anadolu Selçuklu Türbeleri*, pp.37-42 for elevation drawings of the Sitte Melik tomb.
[46] Located at: Lat: 39º 46' 40" N Lon: 040º 23' 11" E. For a detailed description and drawings of the plan and decoration of the Mama Khātūn portal see Ünal, *Les monuments islamiques*, pp.129-142.
[47] See Bosworth, *The New Islamic Dynasties*, p.197 for details about the Sökmenids.
[48] Pancaroğlu, *The House of Mengüjek*, p.55.
[49] Ibid. p.55.
[50] Rogers, *Calligraphy and Common Script*, p.109 states that the earliest standing tombstone in the Ahlat cemetery is dated 585/1189.
[51] Earlier stone *muqarnas* can be found in the architecture of Fāṭimid Cairo, an example being on the inside of the Bāb al-Futūḥ (c. 479/1087). See Bloom, *Arts of the City Victorious*, p.125 and p.126, fig.93.
[52] A door, originally from the Kuyulu Hoca Paşa Mescidi (c. thirteenth century) in Ankara, and now in the Etnografya Müzesi in Ankara, accession number 8015, has clearly visible incised construction lines.
[53] Rogers, *Waqf and Patronage*, p.101.

[54] Pancaroğlu, *The House of Mengüjek*, p.41.
[55] Ousterhout, *Master Builders of Byzantium*, pp.212-214 describes the various sites where iron cramps are known to have been employed with marble. The most common use is to tie together the blocks of the dome cornice of churches, an example being the Fatih Camii in Enez. Ibid. p.215, fig.175 shows cramps set in lead that are almost identical in shape and size to the one in Sivas.
[56] Located at: 39º 44' 39" N Lon: 037º 01' 00" E. For more details of the Gök Madrasa see Blessing, *Rebuilding Anatolia*, pp.104-115.
[57] Surviving examples in Akşehir include the Great Mosque, the Güdük Minare Mescidi and the Ferruh Şah Mescidi, all built in the first quarter of the thirteenth century.
[58] Pancaroğlu, *The House of Mengüjek*, p.41.
[59] Kuban, *The Miracle of Divriği*, p.42 cites the date as from an epigraphic inscription and suggests, based on the scale and the complexity of the carving, that the complex was probably started in the early 1220's. In contrast, Rogers, *Patronage in Seljuk Architecture*, p.91 suggests that 626/1228-9 was the foundation rather than completion date. Kuban, *The Miracle of Divriği*, p.148 notes that the only use of a *muqarnas* hood is over the later east window, which was not part of the original design, and was executed by a different craftsman.
[60] See Önkal, *Anadolu Selçuklu Türbeleri*, pp.37-42 for elevation drawings of the Sitte Melik Tomb.
[61] Pancaroğlu, *The House of Mengüjek*, pp.39-41.
[62] Ibid. p.39. No specific reason for the attribution to Kilij Arslān II is given and Öney, *Summary of Lion Figures*, p.52 assumes that the Alay Han is of thirteenth century construction.
[63] Pancaroğlu, *The House of Mengüjek,* p.35. It is quite possible that the tomb was built during his lifetime, which, coupled with the lack of a firm date for the han, could indicate that the Alay Han being earlier is an erroneous assumption.
[64] The portal to the mosque, also referred to as the Alaeddin Camii, is located at: Lat: 37º 52' 25" N Lon: 032º 29' 34" E.
[65] Tabbaa, *The Transformation of Islamic Art*, p.160.
[66] See Tabbaa, *Constructions of Power*, pp.80-81 for numerous examples of surviving Ayyūbid portals with similar strapwork decoration in Aleppo and Damascus.
[67] Located at: Lat: 37º 52' 29" N Lon: 032º 29' 35" E. See Rogers, *Waqf and Patronage*, pp.77-80 and McClary, *Rūm Saljūq Architecture*, pp.77-79 for evidence that the portal predates the madrasa to which it is attached, which was built in 649/1251-2.
[68] A vaulted room enclosed on three sides, the fourth side being open with a monumental arch, (Sourdel and Sourdel-Thomine, *A Glossary of Islam*, p.81).
[69] Tabbaa, *Constructions of Power*, p.112 and p.118.
[70] Redford, *The Alaeddin Mosque*, p.71.
[71] The Mashhad al-Ḥusayn *īwān* is enclosed within a courtyard, and thus not as external or visible as the two Konya portals.
[72] The *īwān* strapwork features a line through the central upper circle in the manner of the Madrasa al-Sulṭāniyya *miḥrāb*, unlike in Konya, while the square motif in the two upper corners resolves in a slightly different manner to that of the two Konya portals. Although the upper band of epigraphy had been altered, it may be assumed that the original foundation inscription was in the same location.
[73] Gierlichs, *Das Mosul-Tor*, p.202. In ibid. p.195 the author argues that the decorative and morphological grammar employed in the Byzantine churches in the South Anatolian-North Mesopotamian art region provides a number of the foundations of the visual language employed by the designers of the Islamic structures in the region and beyond.
[74] Janabi, *Studies in Medieval Iraqi Architecture*, p.253. Although Badr al-Dīn Luʾluʾ was not ruling until 631/1233 (ibid. p.53) it is possible that the gate was built prior to that date, as he

was appointed regent from 607/1210 onwards. For details of his rule see Patton, *A History of the Atabegs*, pp.157-174.

[75] See Janabi, *Studies in Medieval Iraqi Architecture*, pl.175.

[76] Ibid. p.353 points out that the coiled and elongated bodies of the dragons form the arch of the portal. See ibid. pl.175. The portal has been recently rebuilt after extensive damage and earlier images give a more accurate impression of its original appearance.

[77] Bell, *Amurath*, p.190 and figs.114 and 115. The gate was destroyed in 1917 by the British. For a detailed study of the gate see Sarre and Herzfeld, *Archäologische Reise im Euphrat*, Vol.1, pp.34-40 and Kuehn, *The Dragon in Medieval,* pp.124-129.

[78] Janabi, *Studies in Medieval Iraqi Architecture*, p.252. See Bell, *Amurath*, fig.115. Pancaroğlu, *The Itinerant Dragon-Slayer*, p.160 disagrees, suggesting that the whole composition is an apotropaic device, and that the seated figure is a personification of the sun.

[79] For details of the Caliphal *futuwwa* movement see Goshgarian, *Futuwwa in Thirteenth Century Rūm*, p.230.

[80] The multivalent symbolism of the dragon has been noted in Kuehn, *The Dragon in Medieval,* p.124, and the abstracted symbolism in the Konya examples fits into a wider understanding of its use.

[81] In both cases, the brackets are purely decorative, as they have no load bearing role, having been cut from the impost block that supports the arch.

[82] Grabar, *Jerusalem*, p.142. The east and west façades date from the Latin occupation, but the work on the north façade appears to be datable to the work on the north porch. That work represents Muslim patronage using Crusader motifs, or maybe even *spolia*, such as the elbow brackets.

[83] Hamilton, *The Structural History of the Aqsa Mosque*, pp.39-40. He goes on to suggest that the blocks may be twelfth century spolia. See ibid. p.40, fig.21 for a plan showing the location of the blocks, along with plates XXII.3, XXIII.1-6 and XXIV.1-4 for images of all the surviving blocks on the porch in 1949.

[84] Hazard, *A History of the Crusades*, p.80 describes the elbow bracket as a characteristic invention of the Crusaders. Surviving examples in a Christian context can be found on the western wall of the cloister of the Church of the Holy Sepulchre in Jerusalem.

[85] Hillenbrand, *The Crusades,* p.383.

[86] See Yalman, *Building the Sultanante of Rum*, p.137 and p.214 for an argument that the Rūm Saljūq Sulṭāns were attempting to connect Konya with the idea of a heavenly Jerusalem.

[87] As well as a glazed tile façade for the tomb of the patron and other glazed accents in the north *īwān*, the majority of the structure in Sivas is built in brick, in the manner developed in Iran in the previous two centuries.

[88] The foundation inscription of the ʿIzz al-Dīn Kay Kāwūs Hospital in Sivas describes him as "*the pillar of Islam and Muslims, the Sulṭān of the land and the sea, the crown of the Saljūq family… Amīr of the Believers".*

[89] Ousterhout, *Master Builders of Byzantium*, p.131. Bricks generally shrink by about ten percent during the firing process.

[90] Kiani, *Recent Excavations in Jurjan*, p.126.

[91] Godard, *Gurgān*, p.972 gives the size, but notes that there are some variations in the thickness of the bricks. For more details, and historical context of the tomb, see Michailidis, *The Lofty Castle*, pp.120-138.

[92] There are extant brick structures dating from the twelfth and thirteenth centuries across the entire region, from Akşehir and Afyon in the west, Antalya in the south, through Aksaray and Sivas in the centre, to Van in the far southeast of Anatolia.

[93] See Hinz, *Islamische Masse* for Islamic metrology, and Schilbach, *Byzantinische Metrologie* for a study of the units of measurement used by Byzantine craftsmen.

[94] See Hill, *The Book of Knowledge* for a translation of the Bodleian Library MS. Graves 27, dated 891/1486, a copy of a text dating from 742/1341.
[95] Ibid. p.279.
[96] Hinz, *Islamische Masse,* p.64 states that the Arabic *ad-dhirāʿ as-sarʿiyya* corresponds exactly with the Persian *ẓarʿ-e sarʿī*, given as 49.875cm, but makes no mention of the *shibr.* In the Byzantine context, Schilbach (1970), pp.19 and 44-45 mentions the 'span' (*spithami*, σπιθαμή) and gives a distance of 23.46cm used in thirteenth century Trebizond. The ubiquitous nature of the human hand is the reason for the common measurement. Byzantine bricks appear to be based on the *foot* (πούς). Ibid. pp.14-16 gives a range between 31.18cm to 31.89cm
[97] Hill, *The Book of Knowledge,* p.278.
[98] Ibid. p.278. Hinz, *Islamische Masse*, p.54 states that an *iṣbaʿ* is 1/24th of a *dhirāʿ* (c. 2cm), but suggests that an *iṣbaʿ* in Egypt was 3.125cm. He makes no mention of the *iṣbaʿ maftūḥ.*
[99] Arık, *Tiles in Anatolian Seljuk Palace* (2008), pp.73-74 tentatively accepts the earlier of the two dates on the building as indicating the main phase of construction, done in brick with glazed tile decoration, but suggests that it may be as early as the reign of ʿIzz al-Dīn Kay Kāwūs I. The later date, 1274, appears to be the date of restoration, primarily executed in stone. Stylistically, the first half of the thirteenth century is more likely. See also Meinecke, *Fayencedekorationen seldschukischer,* pp.390-400.
[100] In addition *RCEA*, Vol.7, p.181 gives the inscription from the west portal that refers to a Persian, 'the work of the master Khusraw, the builder' (*amal ustādh Khusraw al-bannā*).
[101] For a study of the full corpus of early brick *muqarnas* cells in Anatolia see McClary, *Brick Muqarnas*, pp.1-11.
[102] See Hillenbrand, *Saljūq Dome Chambers*, p.353, fig.6.
[103] Ibid. p.360. For other examples of large-scale structural *muqarnas* cells in Iran see: Pope, *A Survey of Persian Art*, pl.320 for Ardistan Masjid-i Jāmiʿ (447-50/1055-8), ibid. pl.305 for Qazvīn Masjid-i Jāmiʿ (507 or 509/1113 or 1119).
[104] A more elaborate example, at the Great Mosque in Van, which featured a larger number of smaller cells was photographed, in a ruinous state, by Bachmann prior to the catastrophic earthquake in the early twentieth century. See Bachmann (1913) pp.69-74 and pls.59-63.
[105] See McClary, *Brick Muqarnas*, pp.4-5.
[106] Based on stylistic similarities, Meinecke, *Fayencedekorationen seldschukischer*, Vol.2, p.461 suggests that Aḥmad Ibn Abī Bakr al-Marandī was also responsible for the Sivas Great Mosque minaret. See ibid. pl.41.2 and 41.3 for pre-restoration images of the two niches.
[107] Several of the processes, such as glaze production and metallurgy, could be sub-divided further, but to do so would add unnecessary complexity and increased conjecture without aiding the understanding of the wider topic.
[108] Dadoyan, *The Armenians*, p.147 states that the population of Anatolia in the early thirteenth century was overwhelmingly Greek in the west and Armenian in the east. Mecit, *Kingship and Ideology*, pp.103-105 states that populations of Sinop and Antalya were predominantly Greek Christians. Yāqūt al-Buldān wrote in the early thirteenth century that the majority of the population of Erzincan were Christian Armenians. See Goshgarian, *Futuwwa in thirteenth-Century Rūm*, p.239. There were also large numbers of Syrian Orthodox Christians living in the south of the region, around Malatya. Leiser, *The History of the Patriarchs*, p.114 states that the Greek population appeared to enjoy justice and fair treatment, according to the *History of the Patriarchs of the Egyptian Church* by Abū'l-Makārim ibn Barakāt, written in 604/1207, however no mention is made of the significant Armenian population.
[109] For further details and examples of the connections between the indigenous ecclesiastical architecture of the Georgian and Armenian communities on the one hand, and the late medieval stone-built Islamic architecture on the other, see McClary, *Rūm Saljuq Architecture*, pp.260-261 and pp.294-296.