

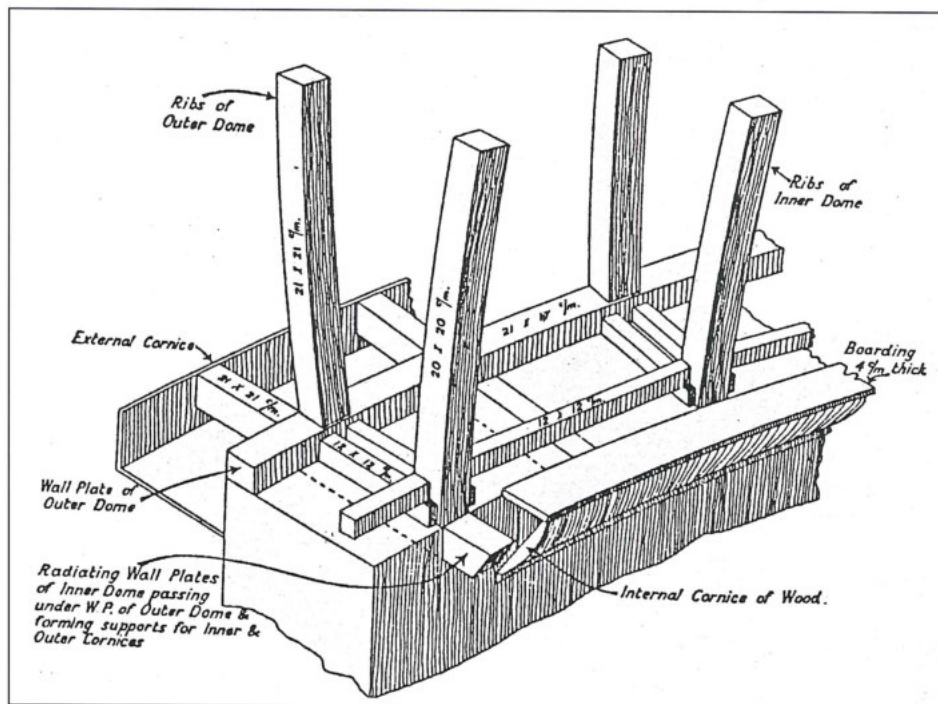
## Woodworking in Early Islamic Palestine

The woodworking industry of the Early Islamic period was highly developed both artistically and technically. Wooden objects from that period include three wooden domes: the domes of the al-Aqşa Mosque, the Dome of the Rock, and the Dome of the Chain in Jerusalem. In addition, there are the wooden tie-beams placed between the capitals in the al-Aqşa Mosque, the wooden beams and panels of the al-Aqşa Mosque roof, the wooden minbar of the Ibrāhīmī Mosque in Hebron, and the three wooden pieces discovered at Qasr al-Ḥallābāt in Jordan.

The wooden dome of the Dome of the Rock consists of two domes, one inside the other, and is constructed with converging ribs. The two domes were described by Richmond, who pointed out that the outer dome is constructed with ribs 21 cm square, which spring from a wall-plate formed of wooden pieces scarfed together 21 cm wide and 17 cm high. The wall-plate is laid on the

outer edge of the drum. The outer dome is divided on the inside into three sections, one above the other, by horizontal plates. The inner dome is also constructed with ribs 20 cm square. Each rib springs from its own wall-plate, which is laid diagonally across the wall, radiating from the centre of the dome and passing under the outer dome wall-plate. The inner dome, like the outer dome, is built of three sections, and its wooden boards are fixed by iron nails on the inner face of the ribs (Richmond 1924: 11-13; Creswell 1969: I:92-95) (FIG. 1).

The Dome of the al-Aqşa Mosque, according to my observation, is very similar in its construction to the Dome of the Rock. It also consists of two domes, one inside the other. The outer dome is formed of ribs 21 cm square, which spring from a wooden wall-plate. The outer dome is also divided into three sections by horizontal plates, and between each two ribs there is a third one



1. Dome of the Rock. Part of the wooden dome structure (after Richmond 1924).

placed diagonally to tighten them (FIG. 2). The inner dome is constructed with long ribs formed by two pieces joined by scarfing and tightened by nailed iron bands. Each rib sits on its own plate, which is laid diagonally across the wall and which passes under the outer dome wall-plate. The wooden boards of the dome are fixed from the inside by iron nails on the ribs.

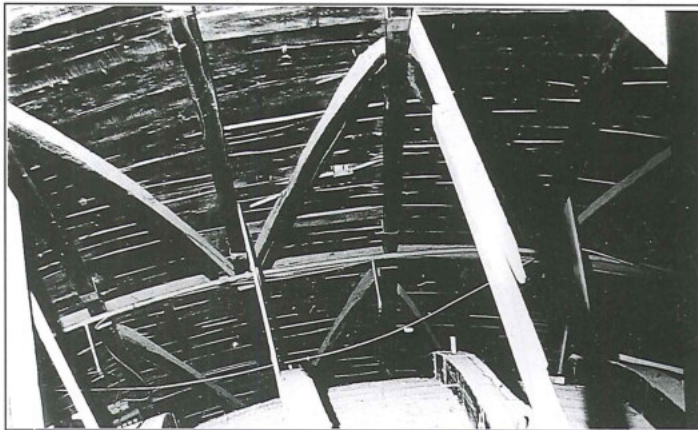
The Dome of the Chain, as it appeared during the restoration of 1990, consists of a wooden dome on the outside and a concrete dome on the inside. There is no space between the outer and the inner domes. The outer dome is constructed of wooden ribs 20 cm square, each of which sits on its own wooden piece placed diagonally across the wall, projecting about 30 cm from the outside and extending 80 cm along the wall (FIG. 3). The inner dome is constructed with stone and mortar and covered with ceramic tiles on the inside. However, it seems that this inner dome is of a later date and that the original Dome of the Chain had two wooden domes, the same as those of the Dome of the Rock and the al-Aqsa Mosque.

The wooden tie-beams of the al-Aqsa Mosque are placed along the arcades and laid end to end on the capitals. Each tie-beam is composed of two beams with a rectangular section 21 cm wide and 15.5 cm high. They are connected by cross-pieces at intervals of about 75

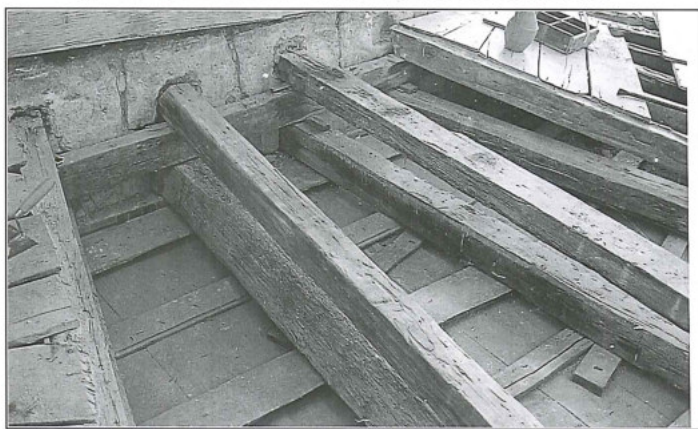
cm. The cross-pieces are inserted 14 cm into the sides of the beams and leave room for 3 cm boards to be nailed to them below. Each board is about 6.75 m in length and is scarfed together above the capitals (Hamilton 1949: 3) (FIG. 4).

The wooden beams and panels of the al-Aqsa Mosque were laid across the arcade resting on the east and the west walls, but they were taken down in 1938. Each beam is about 13 m in length and is formed of one or two trunks of cypress wood fastened together and encased with wooden planks, which were nailed either to short vertical and horizontal ribs attached to the trunks or directly to the trunks themselves. Carved panels, also of cypress, were nailed on both extremes of each beam. Those panels are approximately 2 m long, 58-60 cm wide, and 8 cm thick, with a carved part measuring between 90 and 110 cm. Four more identical beams carrying oblong carved panels were fixed in an inclined position at the four corners of the arcade; they have also been taken down. Ten small beams were also taken down that were fixed at the north and south sides of the trusses between the inclined beams at the corners, the beams are 2.5 metres long and each carries smaller-sized carved panels that measure between 30 to 35 cm in length and 20 to 25 cm in width. The carved patterns on those small beams are somewhat similar to those on the larger ones (Hamilton 1949: PLS. 43-71) (FIG. 5).

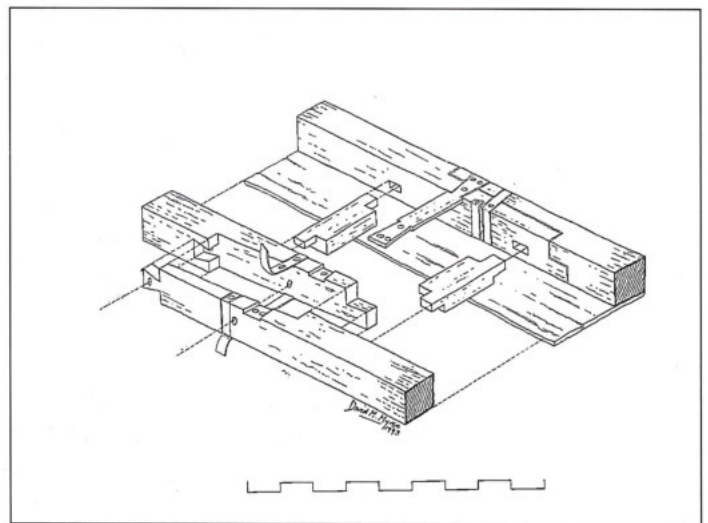
The Hebron mosque *minbar*, dated to 484 AH/AD 1091-1092, consists of an entrance, staircase, and platform. The entrance is rectangular, formed by decorated beams and cross-beams framing the door, and is surmounted by a panel of Kufic inscriptions that carries a cornice formed of cavities decorated with painted ornamentation on a gilt background. The entrance opens onto the staircase, which is bordered by two balustrades decorated with geometrical *mashrabiya* designs, and which



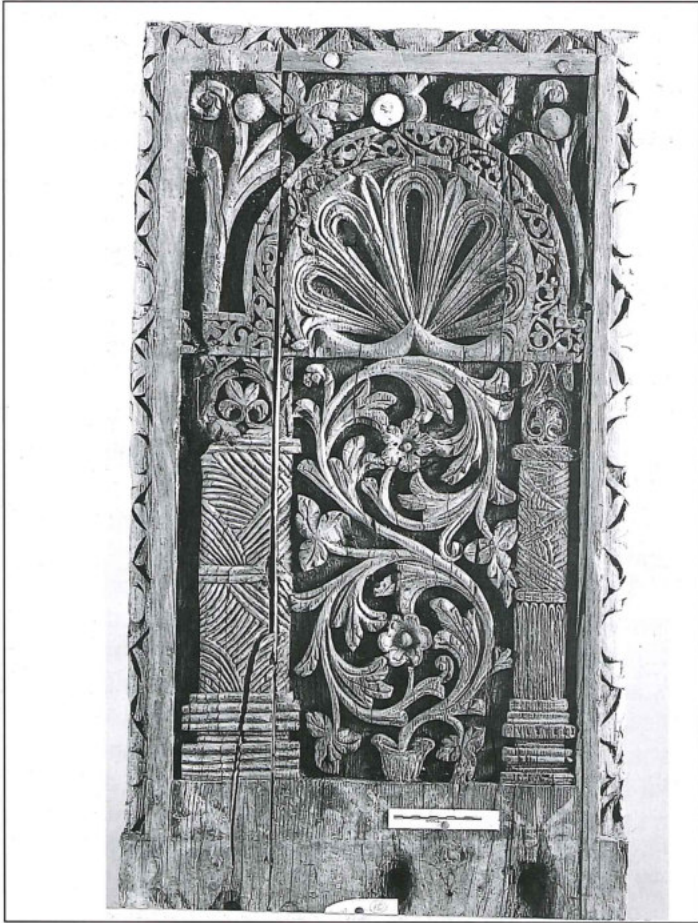
2. al-Aqsa Mosque. Structure of the outer dome from inside.



3. Dome of the Chain during the restoration of 1990.



4. Al-Aqsa Mosque tie-beam. Isometric drawing showing the construction.



5. Carved wooden panel from the al-Aqsa Mosque in Jerusalem.

leads to the platform at the top of the *minbar*. The platform is shaped like a pavilion, decorated on the inside and outside with carved panels, and crowned by another cornice of cavities decorated with painted elements similar to those of the entrance cornice (Abu Khalaf 1985: 278, PLS. 135-138) (FIG. 6).

Finally, three wooden panels were discovered during the excavation of Qaṣr al-Ḥallābāt in Jordan (Bisheh 1982: PL. 36). The first panel is covered with vine scrolls, one of which has three grapes attached. The second panel has long acanthus leaves placed vertically (Abu Khalaf 1985: PL. 23a, b) (FIG. 7), similar to those forming the frames of the Mushatta facade (Dimand 1937: 36 N), while the third panel is a turned wooden piece probably used as part of a balustrade (Abu Khalaf 1985: PL. 24) (see FIG. 20 below).

### Tools

A study of those wooden remains shows that several techniques were used to construct and decorate them. The main techniques include shaping, joining, turning, and carving. However, before discussing those techniques it is important to consider the types of tools used at the time.



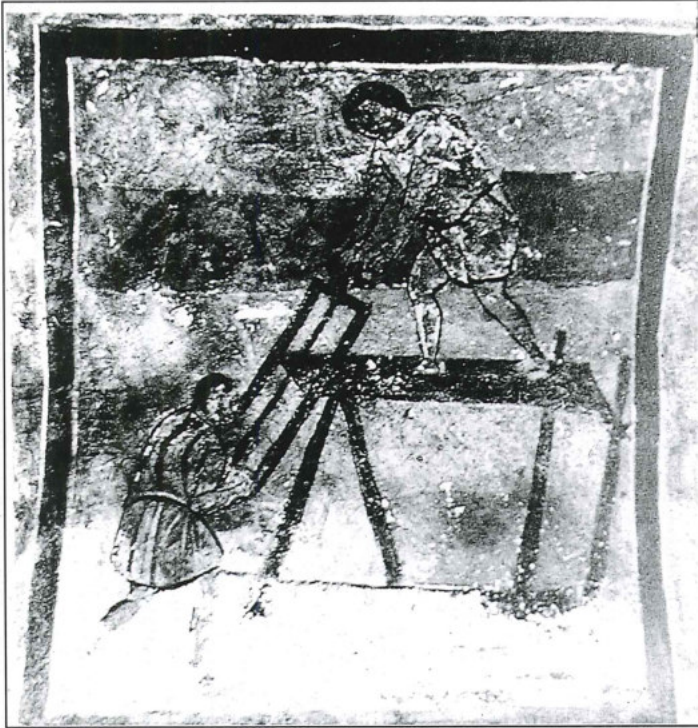
6. Carved wooden *minbar*. Hebron mosque.



7. Carved wooden piece from Qaṣr al-Ḥallābāt.

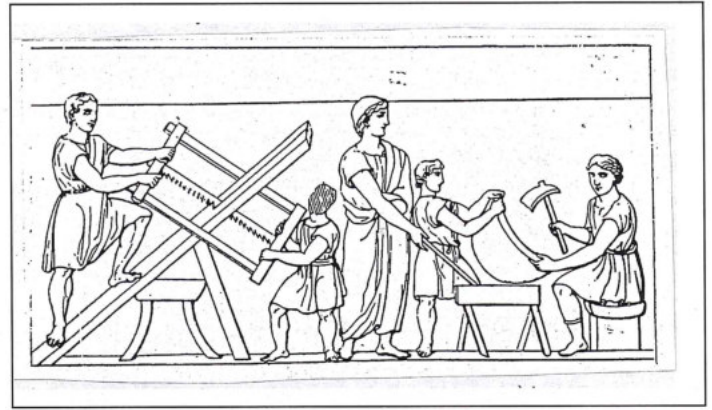
According to literary sources, the carpentry tools in use during the Early Islamic period included saws, drills, planes, adzes, axes, chisels, and gouges (Oughton 1976: 28; Singer 1956: II:230).

The most important tool is the saw, used for cutting wood. It appears in different shapes and sizes – the most common types are the framed saw and the bow saw. The



8. Fresco painting from Qusayr 'Amra in Jordan, showing the early Islamic framed saw (after Almagro *et al.* 1975).

earliest example of an Islamic framed saw – a blade inserted into a crude wooden frame (Goodman 1964: FIG. 122) – can be seen on the fresco paintings of Qusayr 'Amra dating to the Umayyad period (Almagro *et al.* 1975: PL. 38a) (FIG. 8). Another example of a later date appears in the miniature painting of a *Kalila wa Dimna* manuscript dated to AD 1220 (Rice 1971: FIG. 15) (FIG. 9). That type of saw is also found in the Roman period, where it appears in a relief in Florence (Goodman 1964: FIG. 122) (FIG. 10). That indicates that the framed saw



10. Drawing showing the Roman saw in Florence (after Goodman 1964).

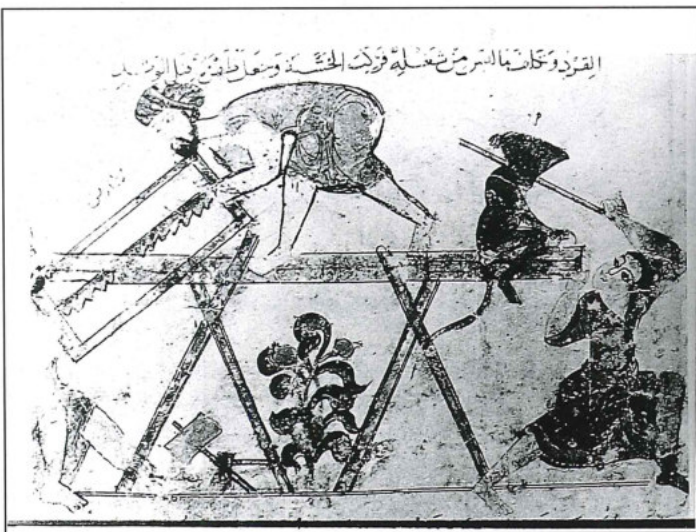
continued in use in the Islamic period without major alterations.

The bow saw, a narrow blade held between wooden uprights connected by a cross bar, also appeared in the Roman period. Above the bar, the upright wooden pieces are linked by a well damped cord tied to each end of the upright wooden pieces (Goodman 1964: 152). There is no evidence for that type of saw in the Islamic period, but a similar saw, very much like the Roman one, is still in use in Iran, which indicates that the bow saw was used during the Islamic period without alteration (Wulff 1976: FIG. 117) (FIG. 11).

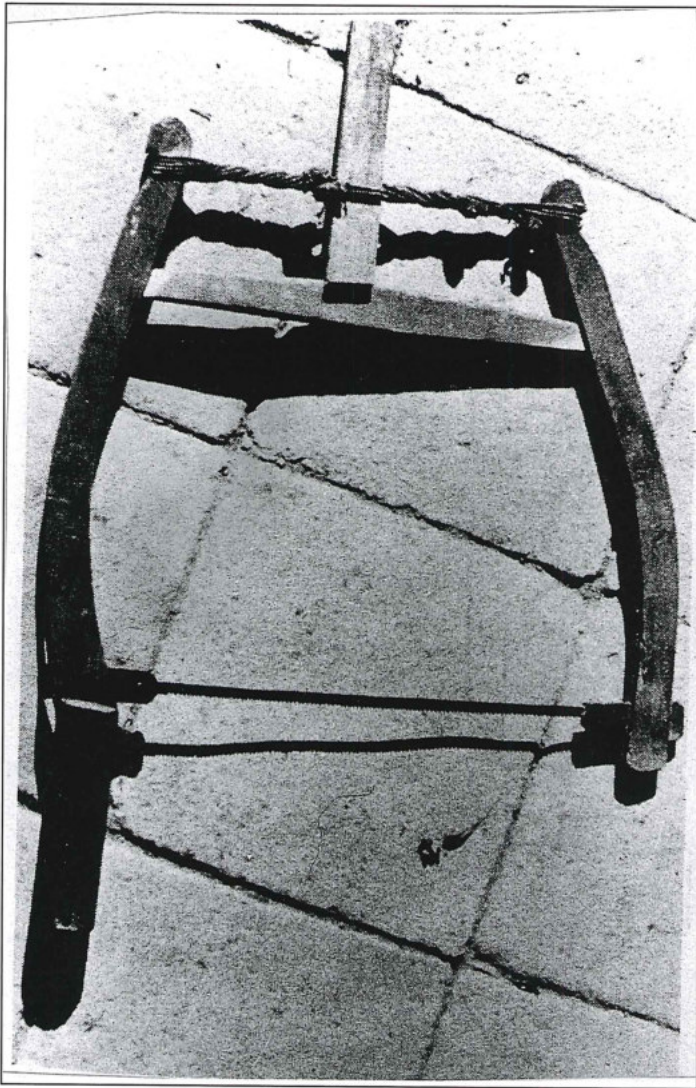
The drill was well known from as early as the third millennium BC. A relief panel in Saqqāra from about 2540 BC depicts a craftsman using it. The same kind of drill was used in Greek and Roman times (Singer 1954-57: II: FIG. 206 "O"), which leads one to assume that a similar tool was used in the Islamic period as well. Examples of a later date show that the drill was indeed in use: one example appears among the tools of the Kashmiri carpenter (Michell 1978: 113) (FIG. 12) in the mid-19th century; the tool is still in use in Iran (Wulff 1976: 124-125). Both of those examples are similar in shape to the drill of the Roman period.

The plane is another carpentry tool. There is no evidence to determine the shape of the Early Islamic plane, although a pre-Islamic example was found in the ruins of Pompeii (Goodman 1964: 43-44). However, the later examples of planes, such as the Persian ones (FIG. 13) and others that appear in the craft records of Kashmir (FIG. 12) resemble the later (16th century) European plane (Wulff 1976: FIGS. 115, 120; Goodman 1964: 87a). That indicates that Early Islamic planes were similar to Roman and Byzantine ones.

Other important tools used in carpentry were the axe, adze and chisels of various kinds. The axe was the first woodworking tool used by man. Its use for the felling and preparation of timber remains the same as it was in the past. The remains of a variety of axes dated to dif-

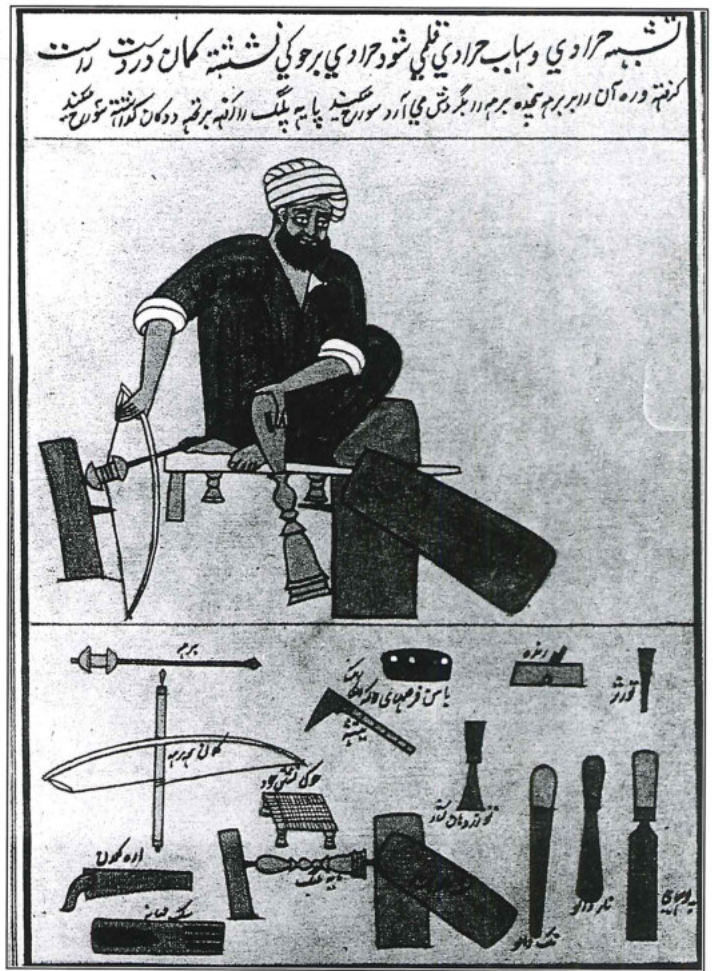


9. Scene showing the Islamic saw from a *Kalila wa Dimna* manuscript (after Rice 1971).

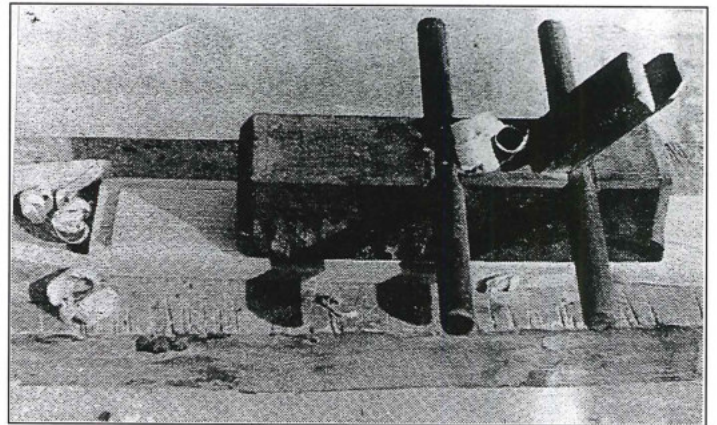


11. Bow saw from Iran (after Wulff 1976).

ferent periods indicate that the tool has not undergone fundamental change (Goodman 1964: FIG. 6). There is no evidence for the Islamic axe; however, a late example can be seen on a Kashmir folk painting that dates to the first half of the 19th century (Michell 1978: 113). But we can argue that if Roman and Islamic planes were related, so presumably were Roman and Islamic adzes. The adze was also well known in antiquity, and its main function was for roughing wood. According to Hamilton, adzes were used on the al-Aqsa Mosque woodwork for squaring the thicker end of the beams (Hamilton 1949: 86). The shape of the adze that was used is not known, nor are we familiar with the shapes of adzes in general in the Early Islamic period; but like the other tools, they presumably were not very different from the Roman ones (Goodman 1964: FIG. 161). Nevertheless, two examples of the medieval Iranian adze were uncovered in the excavations at Nishapur (Allan 1982: 56, nos. 202-203). Some other examples of adzes can be seen in the Kash-



12. Scene showing the wood turning and the carpentry tools used in Kashmir in the 1850s (after Michell 1978).



13. Wooden plane from Iran (after Wulff 1976).

miri 19th century folk painting (Michell 1978: 113) and an example from Persia, which is of a type that probably continues in use (Wulff 1976: FIG. 119) (FIG. 14).

Chisels were well known and widely used for different purposes. The mortise chisel is used for cutting and cleaning vertical slots in framing timber. The blade of such a chisel, according to Green (1981: 40) "has no



14. Adze from Iran (after Wulff 1976).

shoulders, and it is often thicker at the handle end than its width, to withstand heavy blows from a mallet and levering action involved in this work. The back of the blade is perfectly flat in line with the handle, to ensure vertical cutting but the top surface generally tapers slightly towards the beveled cutting edge. "A Roman example of that type of chisel appears on the wall of the house of the Vettii in Pompeii, where a young man is seen using a mortise chisel and mallet, and cutting mortises at the edge of a piece of wood (Goodman 1964: FIG. 189).

The shape of the Early Islamic mortise chisel is not known. However, one example appears among contemporary Iranian carpentry tools. That chisel is probably still in use in Iran, and is not very different from the Roman mortise chisel. Thus it is very likely that the Early Islamic mortise chisel was similar to the Roman one (Wulff 1976: FIG. 123). The study of all of the carpentry tools has shown that there was no substantial change in

shapes, and that there probably has been no innovation since the Roman period.

### The Shaping Technique

The first steps after cutting down a tree are to trim the trunk, and then remove the bark and convert it into planks. Three methods for cutting wood probably were known in the Early Islamic period and were certainly used in later periods and are still in use in our time. They are: 1) the cross-cut method in which the trunk is usually cut horizontally across the grain; 2) the square-cut method, in which the trunk is cut on four sides turning the girth of the tree into a square; and 3) the quarter-cut which entails cutting the log radially (Blanford 1979: 7) (FIG. 15).

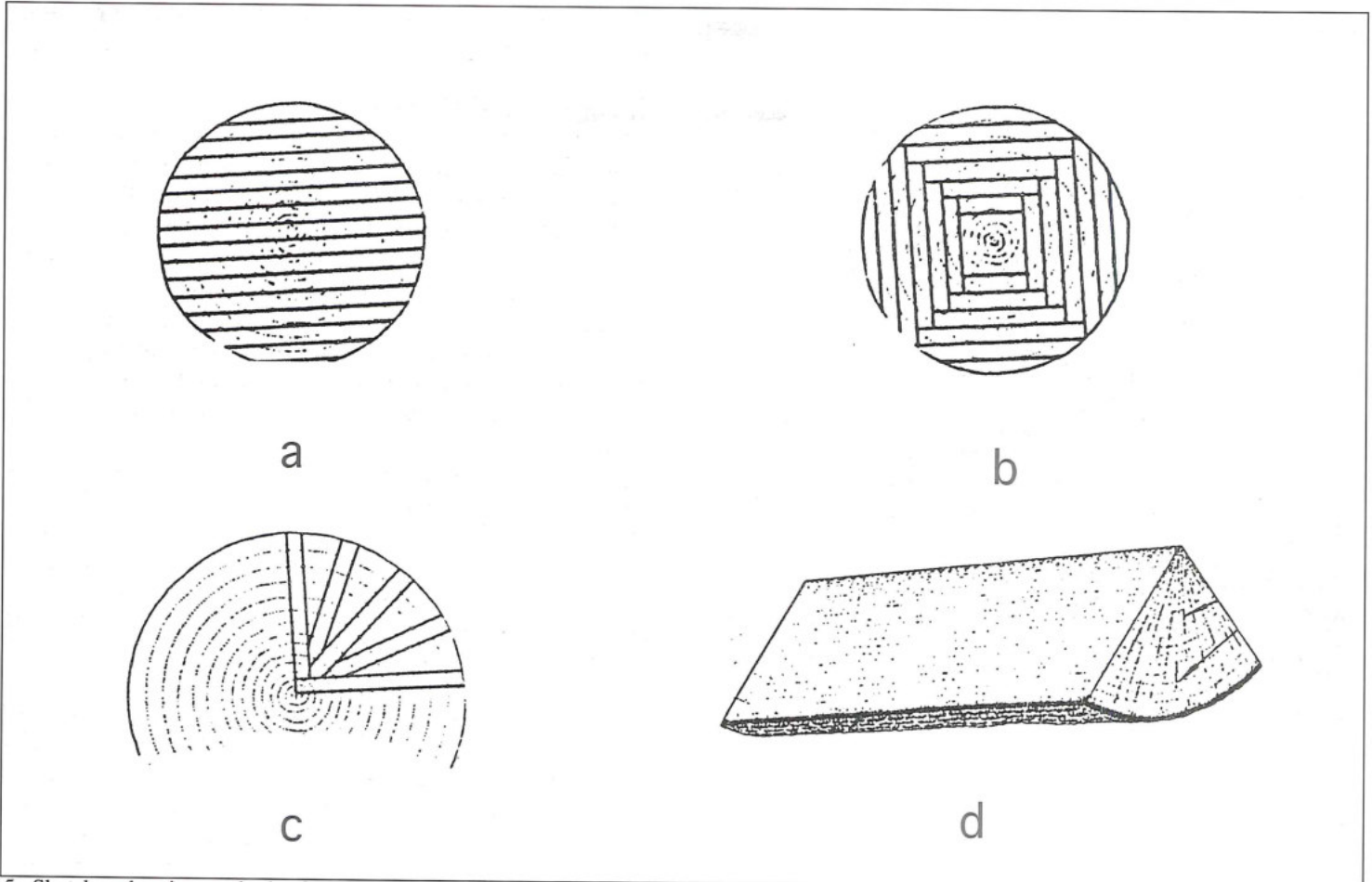
The cutting method can be observed by examining the shape of the grain, because its shape will differ if the panel was cut by the cross-cut, square-cut, or quarter-cut method. A second way to determine the cutting method is by measuring the width of the panel, in order to compare it with the maximum diameter of the tree. The best examples are the al-Aqsa Mosque panels. Each of those panels is composed of two parts, both of cypress. The maximum width of a 20 to 30 year-old cypress tree is 60 cm. It seems that the diameter of the log used for the panels was less than that size, because the maximum width of their pieces is about 42 cm. It seems clear, however, from the method of cutting that the maximum width of a panel could only be obtained by the cross-cut method. That criterion for determining the method used to cut the wood cannot be used in all cases, because sometimes the panels are small in size, but come from large trees. Nevertheless, the shape of the wooden piece can sometimes indicate the cutting method.

### The Joining Technique

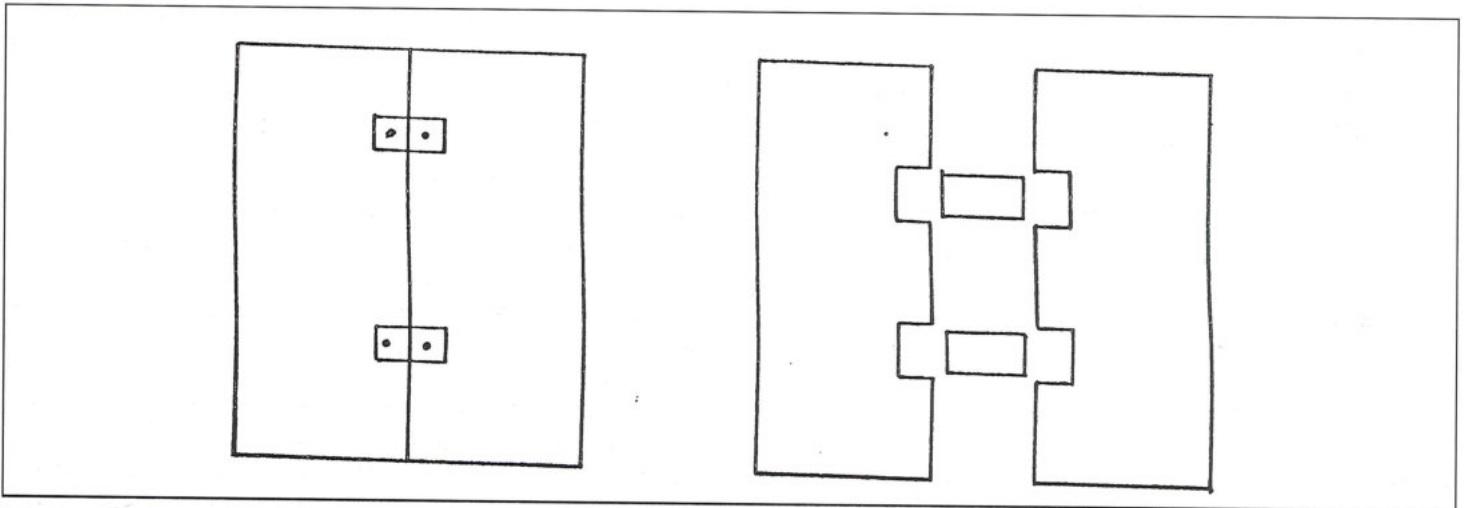
Joining is the most important technique in woodworking and its function is to join wooden pieces together in order to produce the form required. Several methods of joining were used in the pieces described earlier, including 1) tenon and mortise; 2) pinning; 3) scarfing; and 4) dovetailing.

The tenon and mortise method is a process for assembling wooden pieces by fitting a projecting tenon into a rectangular cavity cut into another piece of wood. That method can be seen in the al-Aqsa Mosque panels in Jerusalem. Each of those panels consists of two pieces that are joined together by a single piece of wood that fits into a cavity on each of the adjoining panel edges and which is then held by wooden dowels (Abu Khalaf 1985: FIG. 6a) (FIG. 16).

A tenon and mortise joint can also be seen on the wooden tie-beams laid end to end on the capitals. The beams are joined by cross-pieces inserted into the sides



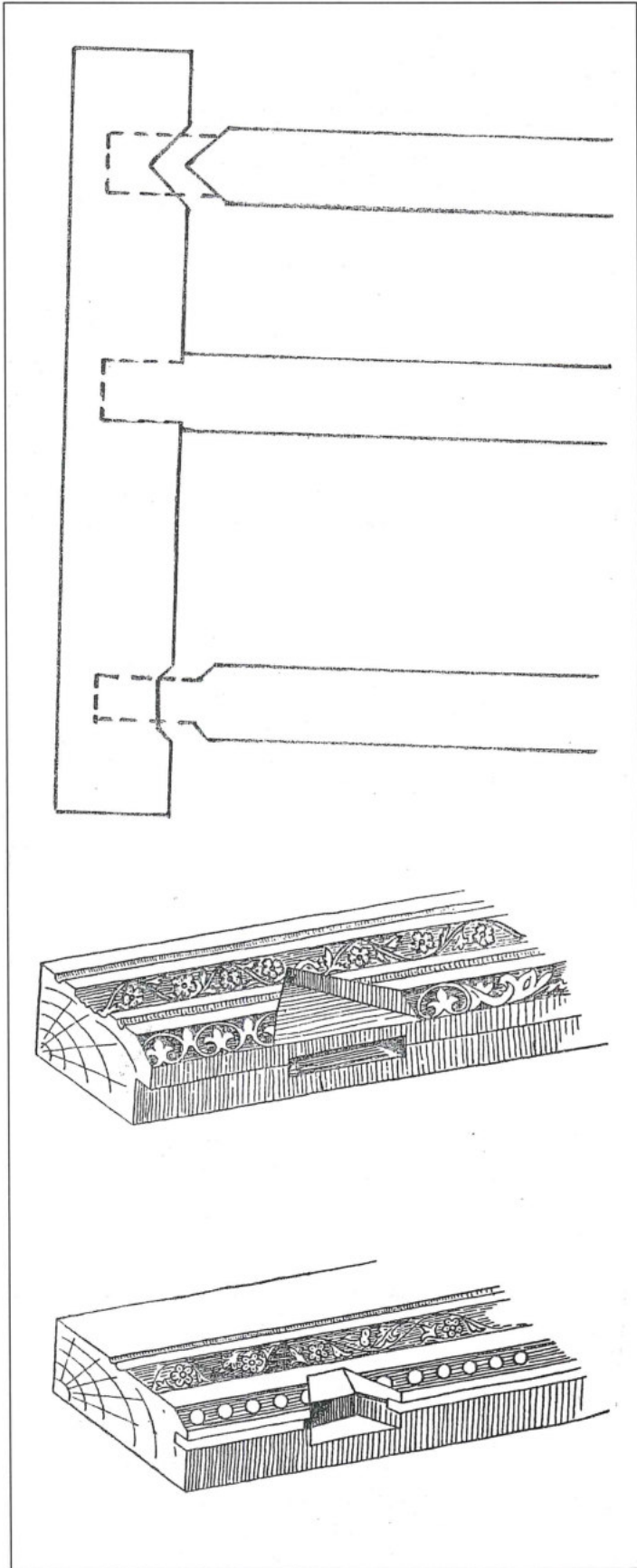
15. Sketches showing methods of cutting (after Blanford 1979).



16. Sketches showing the method of joining of the al-Aqsa Mosque panels.

of the beams by the tenon and mortise method and then nailed by iron nails (Hamilton 1949: 3). Another type of tenon and mortise is that in which the tenon is not a separate piece of wood, but a projection from one of the wooden pieces with the cavity carved into the other. The general structure is usually built of beams and cross-beams that join each other by having the tenon on both

sides of the cross-beams and the cavities cut into the beams themselves. In order to keep the tenon tight in the cavity, they are fixed with wooden dowels. That can be seen clearly on the Hebron Mosque *minbar*, which is constructed of beams and cross-beams joined together by that technique (Abu Khalaf 1985: 246-247). The tenon appears on the outside with either a triangular face, such



17. Sketches showing methods of tenon and mortise joining.

as on a wooden piece from the al-Aqşa Mosque (Hamilton 1949: FIG. 47, no. 21), or a truncated triangular face, as appears on another wooden piece from the al-Aqşa Mosque (Hamilton 1949: FIG. 48, no. 23) (FIG. 17), and sometimes with a straight-edged face, as on the Hebron Mosque *minbar* (Abu Khalaf 1985: PLS. 135-136, FIG. 6b).

Another joining method is pinning, i.e., joining the wooden pieces by using iron nails or wooden dowels. That method was used on the al-Aqşa Mosque panels to fix the carved panels on the beams. The trace of the nails is clear on the panels themselves. The nails have rounded heads and the upper part of their shafts are tapered, while their lower parts are elongated and pointed (Hamilton 1949: PLS. 54, 56, 57) (FIG. 5). Another means of nailing is to use wooden dowels. They were used to hold the tenon in the mortise and for other wood-working purposes such as scarfing. That can be seen clearly on the beams of the al-Aqşa Mosque, where most of the beams are scarfed with a large wooden pin holding the joint (FIG. 18). The pinning method can also be seen on the Hebron Mosque *minbar* to hold the tenon in the mortise (Abu Khalaf 1985: 251-252).

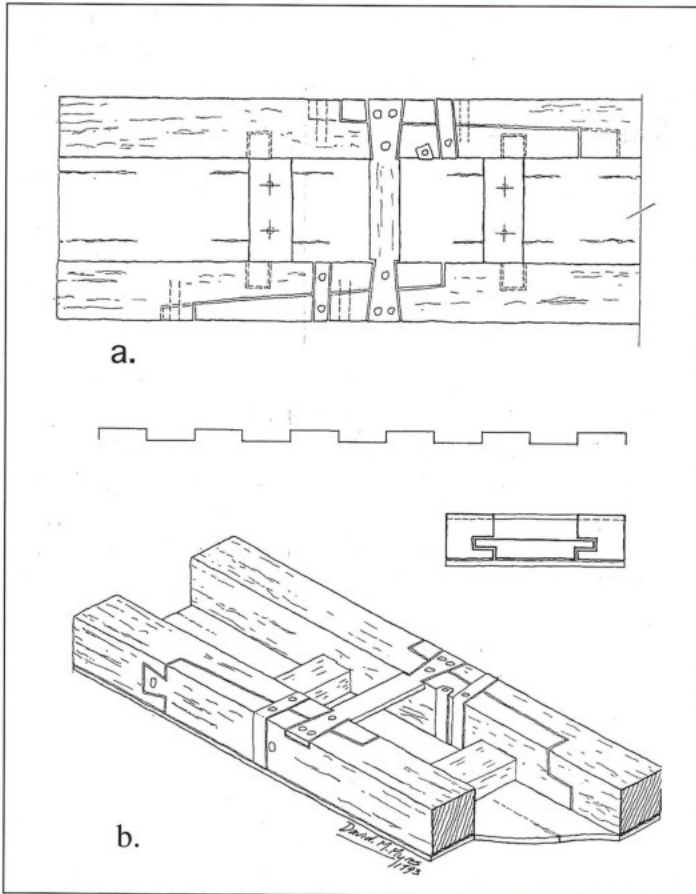
The third method of joining is scarfing, which makes two pieces into a longer piece by joining their ends. The ends of those pieces must be shaped to mesh with each other when placed end to end. To keep the pieces firmly fixed, they are usually joined by wooden pins, which fit through holes in the area of the join (Corkhill 1979: 487). The method can be seen clearly on the al-Aqşa Mosque beams. According to Hamilton, two trunks of roughly equal size were laid thin to thick and then bound and nailed together (Hamilton 1949: 86, FIG. 43). Beam No. 7 is composed of five separate timbers joined by scarfing. The method can also be seen on the tie-beams placed between the capitals of the central facade of the al-Aqşa Mosque (Hamilton 1949: 3) (FIG. 19).

Finally, the dovetailed method which is an end to end



18. Al-Aqşa mosque. Beams of inner dome and scarfing technique.





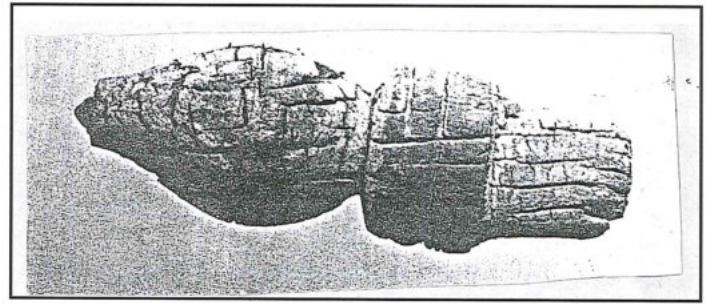
19. Al-Aqsa Mosque tie-beam: a. plan; b. isometric drawing showing the dovetail and scarfing techniques.

joint for pieces at right angles to each other. In general, they cut the fastening of one piece, which are fan-shaped like a dove's tail. These fastenings usually fit into sockets specially prepared at the end of the other piece, without using any kind of pins or nails (Corkhill 1979: 153). An example of this can be seen on one piece, beam seven of the al-Aqsa Mosque (Hamilton 1949: FIG. 43) and wooden tie-beams laid on the capitals of the al-Aqsa Mosque (FIG. 19).

### The Turning Technique

This was a well-known technique in the Early Islamic period. It uses the turning lathe to produce balusters for making balustrades, or making pieces for the *Mash-rabiya* system. The shape of the Early Islamic lathe is not known, but probably was similar to the traditional lathe, as still used in Syria, Egypt, Iraq, and Iran. An example of one appears in the miniature painting recording crafts in Kashmir dating back to the mid-19th century (Michell 1978: 113) (FIG. 12).

Examples of turned pieces can be seen around the lower parts of the inner domes of the al-Aqsa Mosque and the Dome of the Rock, holding the multi-lobed arches and hiding the lower parts of the beams. Other ex-



20. Wooden baluster from Qasr al-Hallabat in Jordan.

amples are the balusters forming the two balustrades placed on the sides of the staircases of the *minbar* of the Hebron Mosque and a turned wooden piece discovered during the excavations of Qasr al-Hallabat (FIG. 20) which was probably used as a baluster. Many turned examples dating to the Coptic period have been found in Egypt (Strzygowski 1904: PL. 9, nos. 7231-7237), which indicate that the turning technique was well known in the pre-Islamic period.

### The Carving Technique

This technique was used for decorating wooden objects from very early Islamic times. To carve a panel, first the piece of wood chosen must have a flat surface. Then the design is transferred on to the chosen piece, being copied from separate sheets. The designs are usually inscribed on the wood with a V-shaped tool, the instrument normally employed for long unbroken lines. The third step is to carve around the motifs and sink the background, so as to raise the motifs clearly from the space around them. The fourth and last step is to trim away around the motifs and finish the carving, so as to clarify the whole surface, which includes the general outlines of the motifs and their background (Abu Khalaf 1985: 257). After this process the carver starts working around the motifs and their surface by decorating and trimming them to the required shape and then finishing the process of carving.

The objects representing this technique are the wooden panels and beams of the al-Aqsa Mosque and the geometric panels of the Hebron Mosque *minbar*. They are covered with a large variety of decorative elements, of vertical-edge carving. The walls appear more or less at right angle. The carver usually trims the walls around the motifs, where the vertical carving becomes clearer and shows the depth of that carving.

From the study of extant wood objects we conclude that there was a developed woodworking industry in Jordan-Palestine in the Early Islamic period. This is evidenced by the quality of those objects and the techniques used in their production. The study also indicates that Islamic woodworking tools and techniques had not undergone fundamental changes compared to their pre-Islamic counterparts.

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