

ARCHITECTURAL INVESTIGATION ON THE BUILDING TECHNIQUES OF THE NABATAEANS WITH REFERENCE TO TOMB 825

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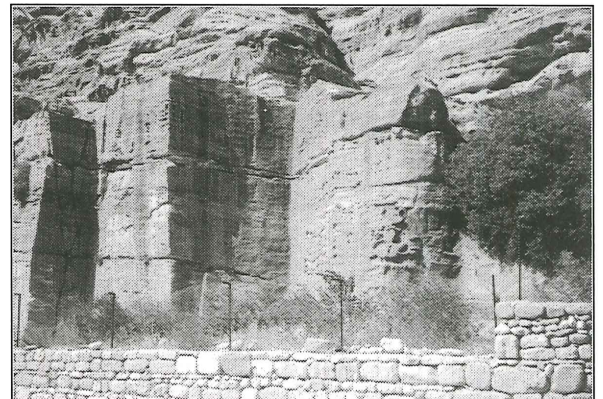
May Shaer and Zaki Aslan

The diversity of architectural styles characteristic of the tomb façades of Petra has been the object of study by many scholars. Brünnow and Domaszewski (1904) recorded the monuments of Petra on maps and classified the rock-hewn tomb façades into seven types based on their architectural features (Brünnow and Domaszewski 1904:137-58). Kennedy (1925:38-51) presented a different typology of these façades, which Browning (1982:77,79-99) rejected, giving yet another nomenclature and attempting to place the different façade types into a chronological order, with the assumption that these architectural styles developed through time. McKenzie (1990:33-53), on the other hand, divided the principal monuments of Petra into groups on the basis of the architectural features of these monuments, and suggested a chronological sequence within each group. Stylistic and typological studies tend to assess and sometimes confirm external cultural influences, whether Hellenistic or oriental. One is not surprised by the presence of architectural features that have been known to exist in other civilized cultures, considering the fact that the Nabataean kingdom was at the crossroads of many of these civilizations. Yet, the architecture of Petra presents a certain individuality and uniqueness, that is captured not only by the monumentality of its buildings, but also by the details of construction that provide insight into what might be referred to as "Nabataean" techniques.

Stone Quarrying

The Nabataeans implemented two types of building techniques in Petra. The first technique is characterized by the construction of buildings out of quarried sandstone

blocks, while in the second technique the Nabataeans carved monuments out of the solid sandstone mountains. Concerning the first technique, we know of a main quarry in Petra, in the area of Wādī aṣ-Ṣiyyagh, where the upper sandstone layer of the mountain was chosen for quarrying since it appears to be of a stronger quality, as is characteristic of the sandstone formations of Petra. It seems that the quarry was first prepared by cutting the edges of the mountain to have a more or less vertical roughly dressed surface (Fig.1). Step ladders were carved into the rock all the way upwards with two hollowed out holes at the top horizontal plane of the mountain (Fig. 2); these were prob-



1. Stone quarry in Wādī aṣ-Ṣiyyagh.



2. Two carved holes at the top of the quarry.

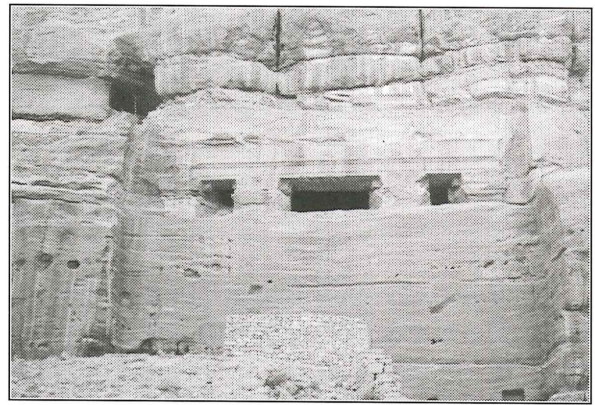
ably made for the hands to be placed and secured at the top of the climb. It seems that channels were then cut into the stone creating slabs with round holes, and are still attached to the bedrock (Fig. 3). In order to detach the slabs from the rock, it is very probable that the method described by Rockwell (1993:34) was implemented. In this method, wooden wedges would have been hammered into the holes of a block, and upon wetting, the wood would then swell, pressing on the sand grains within the stone and thus splitting the stone slab. As an alternative, metallic wedges could have been used and metallic strips would have been placed between the stone and the single wedge, which was then hammered out. Moreover, and as apparent in this particular quarry, it seems that the Nabataeans made use of a joint, existing in the natural rock, in order to simplify the cutting process.

Façade Carving

Many of the monuments of Petra have been built by carving the sandstone rock mountains to create various structures, ranging from simple niches and small basins to rock-cut dwellings and cisterns. Yet, the most prominent features which have been constructed by using this technique are the tomb façades. As evidenced by one of the unfinished tombs of Petra (Fig. 4), the carving of these façades was done from top to bottom, and in this particular façade



3. Stone slabs of the quarry.

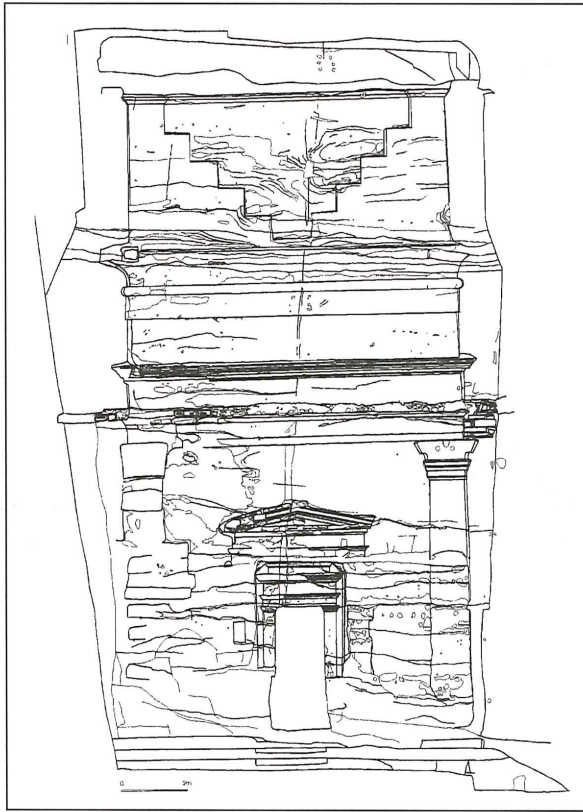


4. An unfinished tomb in Petra.

the entablature and capitals were first completed while the inside of the rock was hollowed out, and, afterwards the stonecutters proceeded downwards in carving the façade (Browning 1982:165). According to Hammond (1973:77), before the façades were shaped, the mountain rock was first cut and smoothly dressed, and this was followed by the carving of details. In order to reach the higher areas of the rock for working, the stonecarvers either came from above or they had movable scaffolding. It is possible that as they started from the top, the stone cutters carved a portion of the upper part of the mountain, making a horizontal platform from which they continued carving to the inside. After that, they went down to cut another lower platform and again carved the façade at that level, continuing in this manner until the whole tomb was shaped.

Tomb 825

Tomb 825 is an example of a rock-cut tomb façade and what follows is an attempt at describing its architectural features that have been found during close examination of the monument. It is a Hegr Tomb as classified by Brünnow and Domaszewski (1904: 406), and consists basically of two sets of large steps, a cavetto cornice, an attic storey, and a classical cornice (Fig. 5). The classical cornice is made up of a sima, bevelled ovolo, corona, dentil element and another bevelled ovolo (Fig. 6). This is followed by a frieze, a bevelled ovolo and

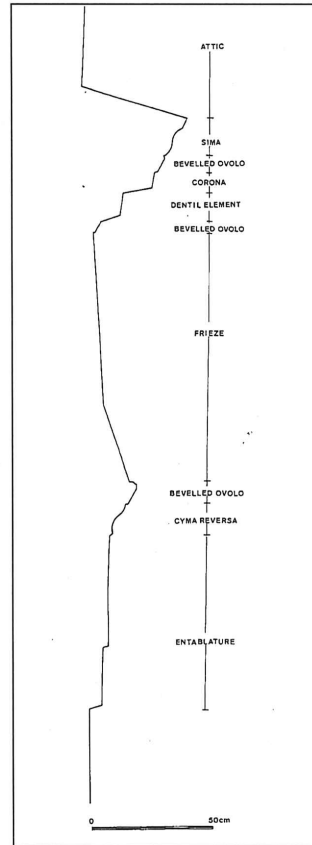


5. Façade of Tomb 825.

cyma reversa, and a two fascia entablature. The doorway consists of an outer triangular pediment order and an inner entablature order, while the capitals are classified as "Type 1 Nabataean" by McKenzie (1990:170), which are actually plain-faced, lacking any floral ornamentation. The facade of this tomb has been cut through at the bottom of the frieze just above the bevelled ovolo where a ceramic pipe has been inserted. This pipe runs also along the northern side of the as-Siq, which at a certain point sits on the road paving and thus is later than the road construction, which is dated to A.D. 50 (McKenzie 1990:38), while the tomb itself would have been earlier than this water system.

The Plan of Tomb 825

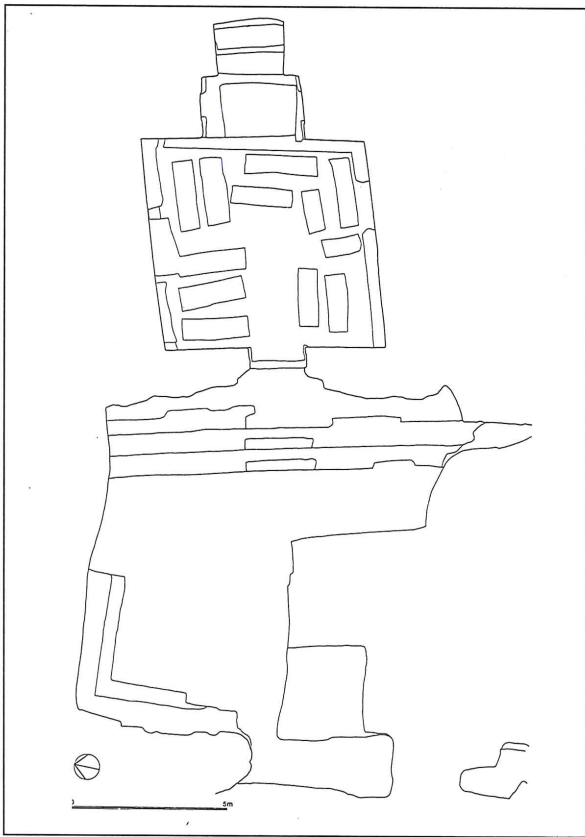
During his visit to Petra in August 1812, the Swiss explorer John Lewis Burckhardt (1822:426) apparently described the interior of the tomb: "in the floor of one sepulchre I counted as many as twelve cavities of this



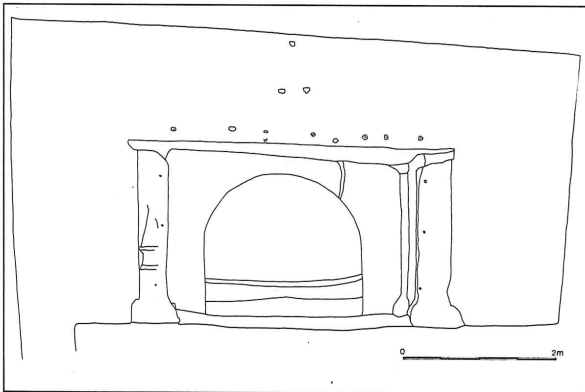
6. Cornice, frieze and entablature of Tomb 825.

kind, besides a deep niche in the wall, where the bodies of the principal members of the family, to whom the sepulchre belonged, were probably deposited". The interior actually consists of a squarish room with fifteen graves cut into the bedrock floor (Fig. 7). The wall opposite the doorway has a recess with a large opening in the ground that might have served as a grave that is much larger than the others. This recess has an arch at the top and pilasters along its corners (Fig. 8) and it opens into another smaller recess which has two other graves cut into the ground. In order to simplify the cutting process, it seems that carving the ceiling was executed following the lithology of the sandstone.

In front of the entrance to the tomb, there is a semi-enclosed space which is bound on its northern and western sides by bedrock walls and leads into the interior chamber by three steps. The north-western corner has what appears to be a kind of "bench" that has been carved out of the



7. Plan of Tomb 825.



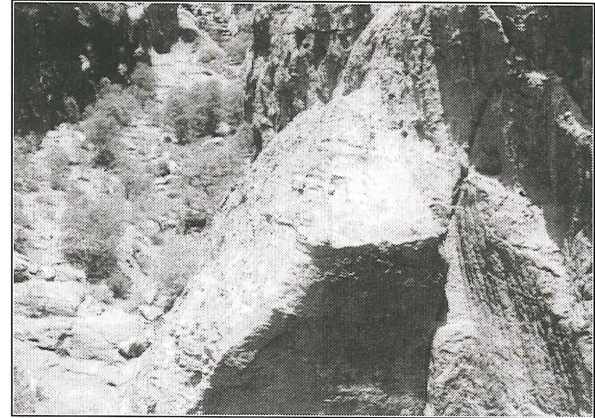
8. East elevation of the interior of Tomb 825.

bedrock, consisting of two levels, and would have probably served as a *biclinium*.

Working from the Top

Like most of the other tombs in Petra, Tomb 825 has been carved out of the sandstone rock. The façade is actually set into the mountain with a certain free area above and along its sides. There is a horizontal cut on the left side of the mountain (Fig. 9) which was probably used as a platform from

which the stone cutters proceeded to carve inside the mountain. Thus, just above the uppermost cornice the mountain is cut to the inside at a height of 1.95m on the left side and 0.7m on the right side. This part was not meant to be seen from below and is therefore crudely finished with a pointed chisel. In the middle of that area but more to the right, we find six mortar patches with textile impressions (Fig. 10), which clearly shows that these were used for attaching a



9. Platform at the top of Tomb 825.

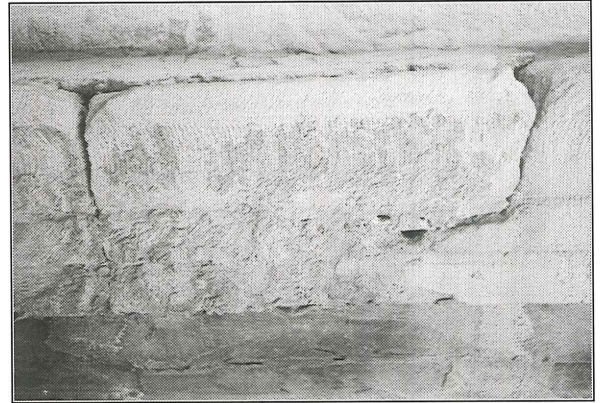


10. Mortar patches with textile impressions.

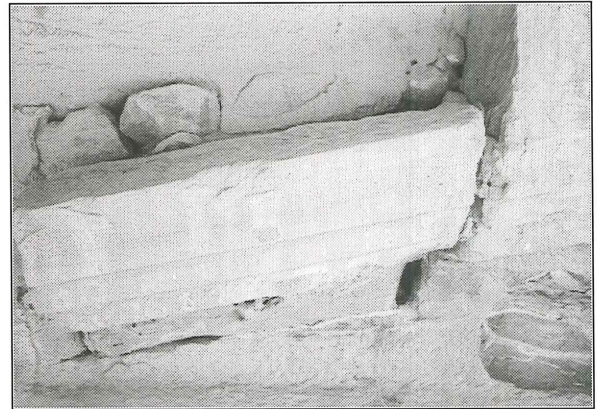
cloth. Most probably the cloth would have held some information, to which there can be many interpretations. One of these interpretations would be that it was a kind of dedication, placed at the initiation of the work, while another would be that it held the name of the owner or the contractor, or it could have contained a sketch of the façade. The former interpretation seems to be the most likely since the position of the patches would not permit what ever that was held there to be seen from anywhere else other than being directly in front of it. On the left hand side and nearly at the level of the cornice, a hole can be noticed, and was probably used either as a mark or as a hook to carry a rope that was used for lifting, or maybe even for fixing a plumb.

Stone Insets

Many parts of the façade have been constructed out of stone insets, especially found along the left side of the monument. Such stone insets are found in the left part of the classical cornice and the left part of the doorway pediment (Figs. 11 and 12), while evidence clearly shows that stone insets were used to construct the left pilaster flanking the façade and the right side pilaster of the outer doorway order. The cavetto cornice has been totally carved out of the natural sandstone except for the extreme left part which retains the place of one missing stone inset. It seems that due to the stone's poor quality in such areas of the façade, it was preferable to insert quarried stone blocks. In order to insert the left part of the doorway pediment, a cavity was first created with an area a little bigger than the exact final size needed, and then the moulded stone pieces were inserted and fitted with smaller stone fragments and then covered over with mortar. The cornice insets include the sima, the bevelled ovolo and the corona, while the dentil element and the bevelled ovolo below are cut out of the natural stone providing support for the insets.



11. Inset of Classical cornice.



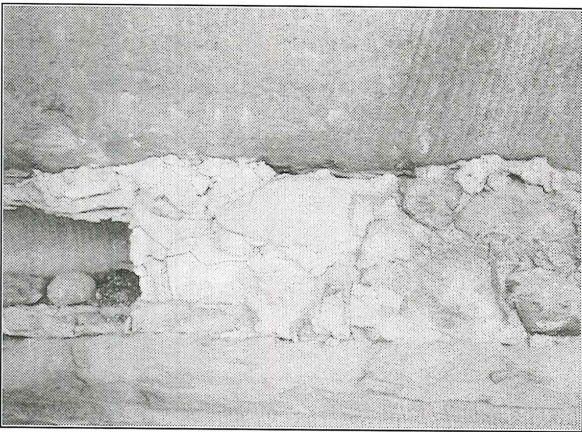
12. Inset of pediment.

The pediment insets begin just where a natural fault of the stone is found, and, the right edge of the first inset takes the alignment of the fault, rather than having a straight cut. The stone piece which is the nearest to the carved section of the cornice has its right side cut in a staggering manner. This was probably a technique implemented for the inset stones which would make the insets sitting on the original carved sandstone cornice in a more stable manner. For insets of vertical architectural elements, grooves were again cut into the façade and building blocks were built from the bottom proceeding upwards.

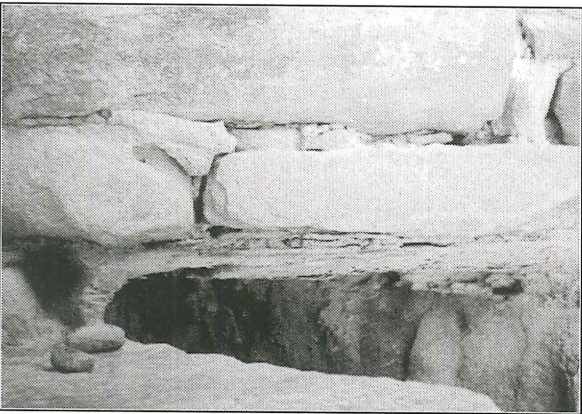
Pipe Installation

At the bottom part of the frieze, and just above a moulding which consists of a cyma reversa and a bevelled ovolo, the stone face was cut and hollowed out creating a cavity in which ceramic pipes were installed and fixed in position with stone fragments and a

mortar mix that was also used in covering over the installations, giving it a hidden appearance with minimum damage to the façade architecture (Fig. 13). On the left part of the façade where the pipe has fallen off, there are some remains of a mortar which look different from that used in binding the ceramic pipe, and hence was probably the mix used in fixing the stone insets of the original first phase. Several holes have been cut along the lower half of the right edge of the monument probably during the phase of the channel installation. These holes might have helped in holding the rope that was used for climbing in order to reach the level of the cornice. Since the ceramic pipe continues before and after the monument itself, stone blocks were constructed to the right side of the façade, providing support for the pipe (Fig. 14). There, a single stone slab was first laid out, spanning the distance from just above the right



13. Pipe installation.



14. Stone construction to carry pipe.

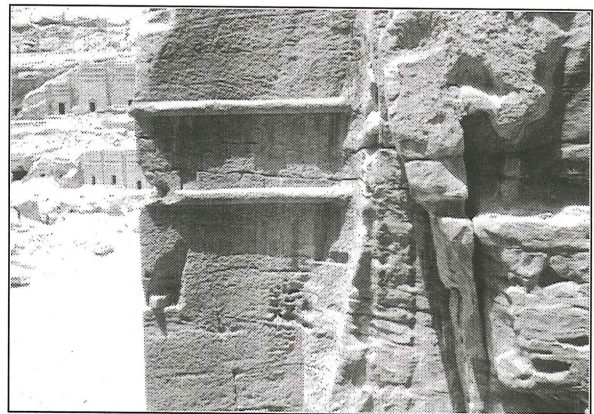
side of the pilaster capital to the edge wall of the façade and acting as a beam on top of which the other stones were laid. The pipe continues into the rock and to the next monument, where at a certain point we still see evidence of the springing of an arch that was once built to carry the pipe at that specific point (Fig.15).

Water Drainage

The upper cornice and the tops of the crowsteps are inclined downwards enabling the water to drain out. About one third of the classical cornice has been built out of stone insets and covered at the top with mortar which slopes down to the outside along with the rest of the carved cornice, and thus acting as a coping. The top edge of the insets closest to the façade wall have been hollowed out creating a kind of channel. There, mortar was laid out, continuing on the back wall in order to seal off the connection between the inset stones and the wall.

Carving and Dressing of the Stone

The façade retains a well-dressed final surface. It seems that the protruding architectural elements were first left as simple blocks, while the plane surfaces next to them were cut and dressed. After that, the elements were shaped and finely dressed, leaving a rough surface which marks the place where the stone had been cut off. The pick axe and the pointed chisel seem to have been



15. Springing of the arch which used to carry pipe.

used in the carving process, since there is evidence of pointed marks on the tops of elements such as the cornice and pediment (Fig. 16). There is the impression of an incised axe on the rock mountain of al-Khubtha (Fig. 17), which might have been



16. Tool marks on top of pediment.



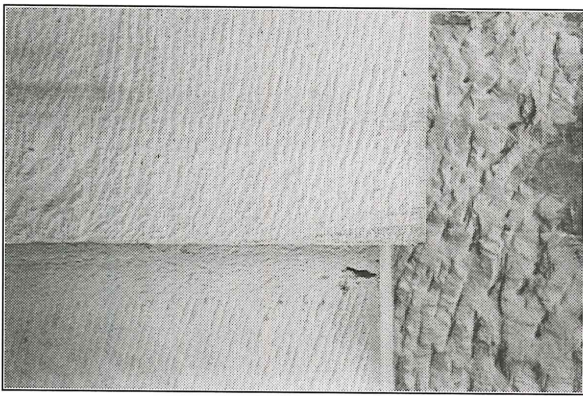
17. Incised axe .

Nabataean and would imply that the axe was used as a basic tool in construction. The pointed chisel was also used in roughly dressing the façade where insets would have been placed, and possibly was used in dressing the open areas creating a surface of parallel lines which is characteristic of most, if not all, Nabataean architecture (Fig. 18). Such dressing lines are nearly vertical or inclined from the vertical by 15° to 30°. In large areas, these parallel lines begin by being relatively straight with an inclination of 15° from the vertical, and then curve to become more inclined at the lower part. The spacing between the lines varies between 6mm for small areas, and about 1cm for the large open areas. Sometimes the protrusion of architectural elements from above renders it difficult to have these parallel straight lines starting immediately from the upper edge and hence at a thickness of a few centimeters, the upper part was dressed with the tool held horizontally, leaving small thin horizontal lines (Fig. 19). The areas dressed with the parallel diagonal lines are most often framed with a 1-2 cm dressing achieved by the use of flat chisels and made up of fine parallel lines that are either perpendicular to the edge or are at a 45° angle. Some of the fine architectural elements such as those of the pediments, are also found to have been totally dressed by use of a flat chisel, giving a finely polished finish.

The stone dressing can have the func-



18. Diagonal dressing of the stone.



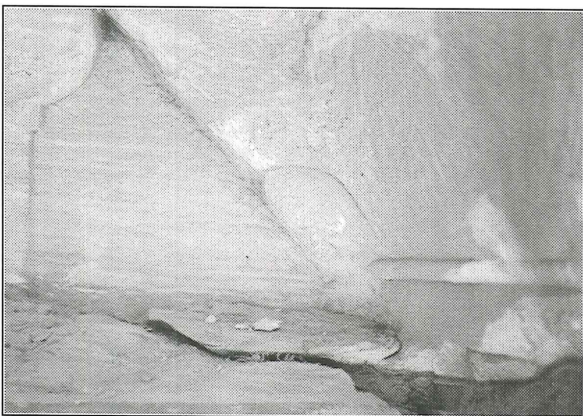
19. Diagonal dressing, horizontal dressing and smoothly dressed edges .

tional purpose of keying plaster, though it has been suggested by others that it could have served merely as a decoration of bare stone walls (Hammond 1973:77).

Plaster and Stucco

Close examination of the façade of Tomb 825 has revealed that it was either fully or at least partially covered with plaster. Very thin scanty remains are found in the middle of the attic storey which is between the Cavetto and the Classical cornices. Moreover, the floral motif on the capital of the outer order of the doorway has been moulded in stucco, which shows that it was used as an original repair, moulded in order to replace the stone which had been broken off (Fig. 20).

The entablature of the inner doorway order as well as the two flanking columns have carved holes which still retain mortar. At about the same level, and on the right

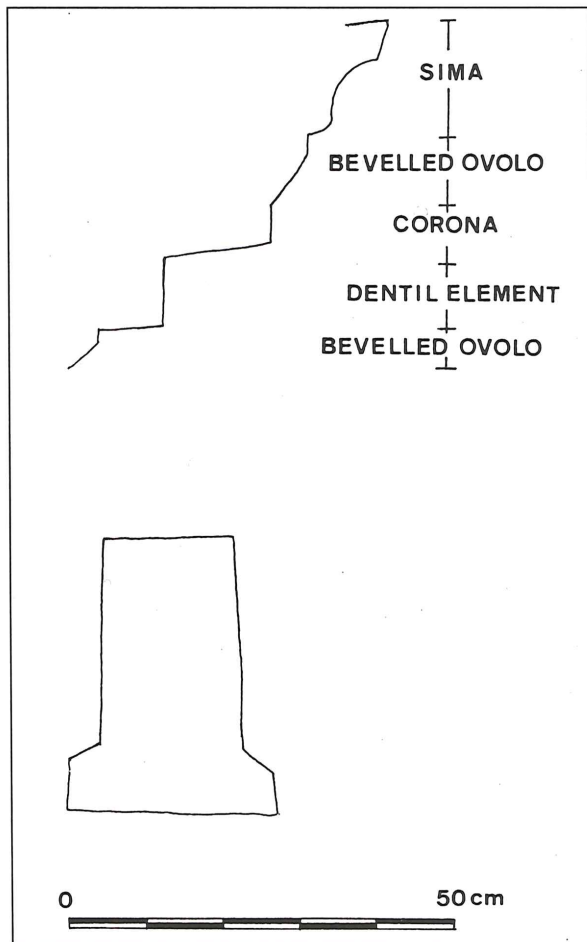


20. Moulded stucco motif on capital.

side of the façade three other holes are found, one of which fully retains mortar and has a small squarish incised hole in its middle, while another does not have plaster but still holds a small rectangular piece of wood. Below these is another row of a set of five weathered out holes that were probably once of a similar nature. The interior of the tomb also has such holes lining the wall facing the doorway entrance. These holes were most probably used to hold plaster and stucco.

Incised Sketches

Several marks were left by the stone masons on the rock, giving further insight into the method of working of these masons. On the right hand side of the rock cavity into which the façade is set, and just above the level of the classical cornice, an architectural sketch is found incised on the rock, consisting of a sima, bevelled ovolo, corona, dentil element and another bevelled ovolo. It is very similar to the actual cornice and it was probably done by the architect or master mason for the craftsmen as an explanation for what was required to be executed (Fig. 21). Below this architectural drawing is an incised block stele that is probably a depiction of the Nabataean god Dushara. Many authors have referred to the fact that the Arabs used to represent their god in the form of a stone slab, where particularly in Petra the principal god Dushara is represented as a black stone block, square shaped and placed on a base made of gold (Patrich 1990: 51). In Petra, it is common that the gods are depicted in the form of carved rectangular stelae, as stone tablets or as being merely incised in the stone itself, neither recessed nor in bas-relief, and in certain cases resting on simple bases (Patrich 1990:59-60;76). Although such rectangular blocks may have actually represented the god Dushara of the Nabataeans, these depictions could have been abstract and indirect representations of the deity



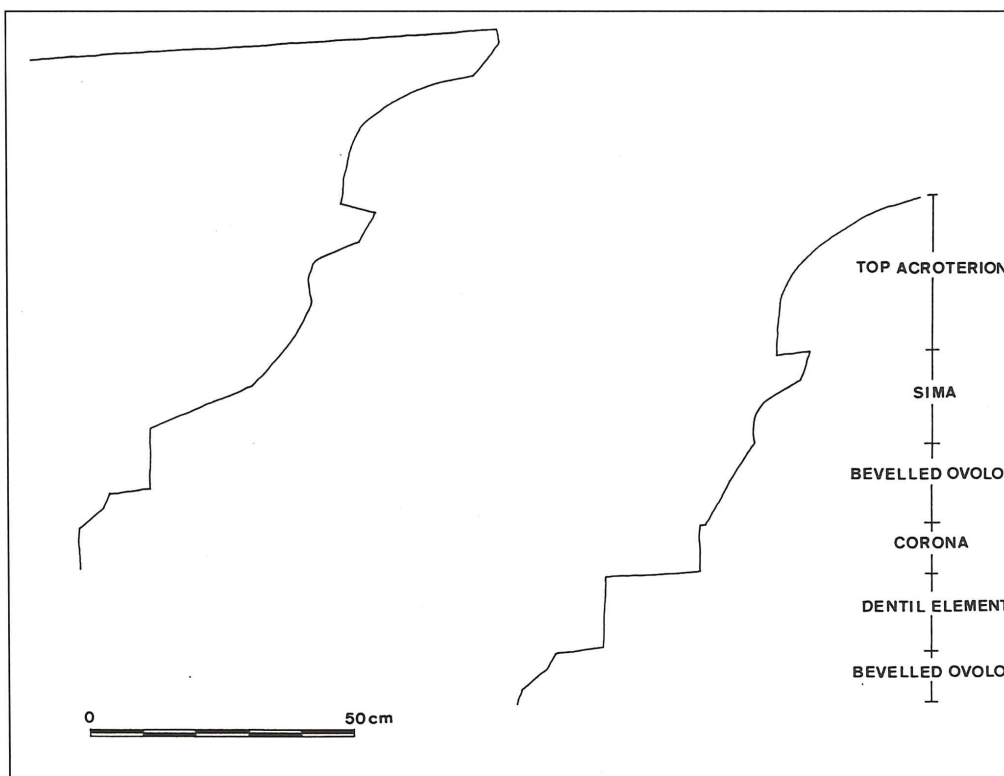
21. Incised architectural elements and block stele.

(Hammond 1973:96).

Futhermore, two other incised architectural sketches are found on the northern wall of the exterior area fronting the tomb, and, representing two profiles that contain some elements found on the façade (Fig. 22). The sketch on the right is similar to the pediment profile in its detail and consists of a bevelled ovolo, dentil element, corona, and another bevelled ovolo, while the two top elements depicted possibly represent the sima and the acroterion. On the same wall but higher up, there is an incision of three lines that are perpendicular to one another and enclosing a rectangular area, which again might have been a representation of Dushara.

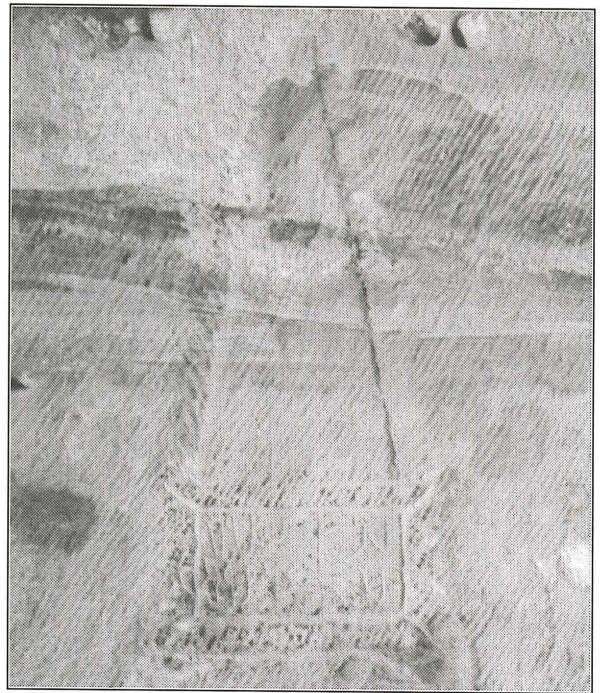
Nefeshes and Inscriptions

On the right column of the inner doorway order, a pyramidal shape is depicted with a pedestal and a top inverted triangle. Five other similar shapes are found on the northern interior side wall (Fig. 23), one of which contains an inscription inside its pedestal base (Fig. 24), while another in-

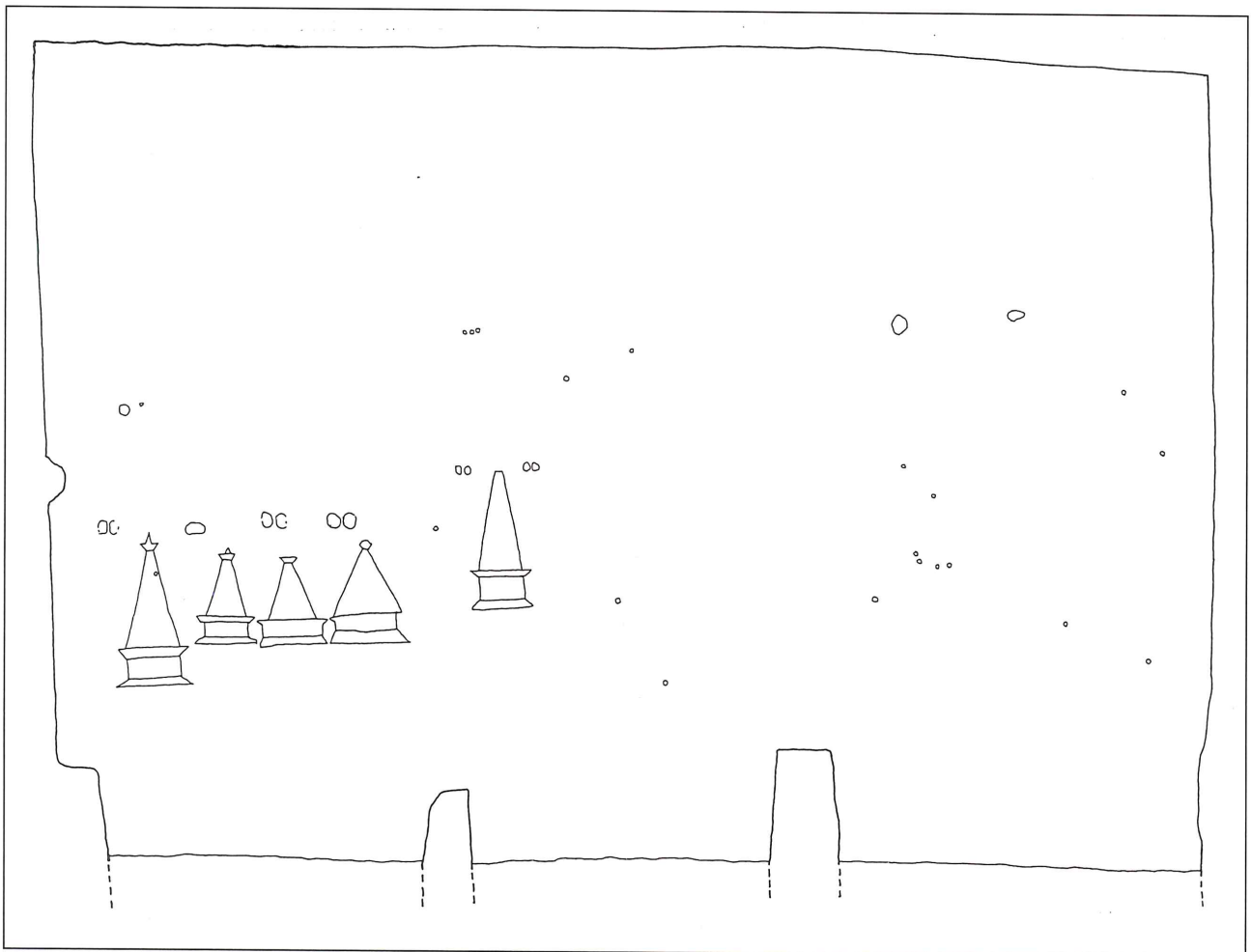


22. Incised architectural elements.

scription is found below the inscribed shape on the left. The translation of the inscription below the pyramidal shape is: “Nefesh of Zaid-Qawmo, son of Yaqum” (Zayadine 1971:59), and the translation of the inscription inside the pedestal of the right pyramid reads: “Nefesh of Yaqum son of Zaid-Qawmo”. Another similar pyramidal shape is incised on the left pilaster flanking the interior arched recess. According to Zayadine (1971:58-9) nefesh means “soul, person”, and hence, the incised stele would then represent the deceased person. Such representations appear to have been common during the Hellenistic period, and particularly in Alexandria (Zayadine 1971:65), while in Petra, it is considered as the only case where these shapes are depicted in relation to tomb burials (Browning 1982:128;



24. An obelisk with a Nabataean inscription.



23. Northern interior elevation with incised obelisks.

Kennedy 1925:49).

Aesthetic Effect of the Façade

Measurement of plans cutting the façade at several levels has revealed that the façade was carved with relatively good precision without any warping that might be conceived by the naked eye. According to Hammond (1973:77), the execution of such constructions did not face complex engineering problems, and with the use of levels and plumb lines the work could be achieved without difficulty. The façade is tapering towards the top giving the tomb a monumental effect that is further emphasized by the fact that the corners of the façade are at oblique angles.

The Significance of Tomb 825

From the inscriptions found inside the chamber, Tomb 825 appears to be a Nabataean family tomb, and furthermore, it has many architectural features that can be considered as being typically Nabataean. Of

these is the carving and dressing of the monument in nearly straight parallel lines giving it a final polished finish and the plain capitals which lack any ornamental features. The scanty plaster remains show that the façade was at least partially coated with plaster. The sketches representing architectural features give us some insight into the craftsmen's method of working, while the nefeshes with the associated inscriptions inside the tomb give further explanation about the significance of such representations. Finally, the symbol of Dushara reveals the identity of the craftsmen as being of the local population who sought the blessing and protection of the gods, as might have been also the case of the mortar patches at the top that could have held such a blessing.

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References

- Browning, I.
1982 *Petra*. London: Chatto and Windus.
- Brünnow, R.E. and Von Domaszewski, A.
1904 *Die Provincia Arabia*. Vol. 1. Strassburg: Karl J. Trübner.
- Burckhardt, J.L.
1822 *Travels in Syria and the Holy Land*. London: John Murray.
- Hammond, P.C.
1973 *The Nabataeans - Their History, Culture and Archaeology*. Gothenburg: SIMA, Paul Aström (ed.).
1995 *Nabataean Architectural Technology*. Pp. 215-221 in *SHAJ V*. Amman: Department of Antiquities.
- Kennedy, A.B.W.
1925 *Petra. Its History and Monuments*. London: Country Life.
- McKenzie, J.
1990 *The Architecture of Petra*. New York: Oxford University.
- Patrich, J.
1990 *The Formation of Nabatean Art. Prohibition of a Graven Image Among the Nabateans*. London: E.J. Brill.
- Rockwell, P.
1993 *The Art of Stoneworking: A Reference Guide*. Cambridge: University Press.
- Zayadine, F.
1971 A New Commemorative Stele at Petra. *Perspective* Vol. XII, 1 and 2: 56-73.