

ARCHAEOLOGICAL RESEARCHES
AT QASTAL
SECOND MISSION, 1985

by
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Thanks to the help provided by the Department of Antiquities¹, the 1983 mission had shown that the palace and the associated mosque at Qastal were built during the Early Umayyad Period. The Entrance Hall of the palace was partly excavated, different plans and sections were taken, and several remains were recognized from a survey on the site: a large dam east of the palace, a tank or *birka* towards the north-west, the remains of a bath west of the palace, some 70 cisterns and numerous walls of a permanent settlement, north and west of the palace. No doubt Qastal was the center of an important farming complex (see Fig. 1).

In addition, Tell Zabayir el-Qastal to the south-west of the site was visited, and a complete sequence of pottery, starting from the Iron Age to the present was recognized: here was the ancient settlement, re-used by the Umayyads who additionally built the palace and the mosque.

The 1985 mission² was planned to improve the knowledge of the site, through an epigraphic survey, the study of the dam and tank and excavations in the southern apartment. Here, thanks to Glueck's

account³ compared to an old Bedu's memories, we expected to find the entrance of the stairway leading down the central main cistern, an underground bath (*sirdab*) and remains of mosaic floors.

In spite of the efforts of the Department of Antiquities, especially Dr. Zayadine, when we arrived in September 1985 we found the palace partly destroyed by the extended concrete house built by Shibli al-Fayez, on the northern corner of the palace (see Fig. 2 and Pls. XXXVI,1,2 and XXXVII,1). Without any regard to Jordanian laws, he ordered the complete destruction, by bulldozer, of the northern apartment, relating with the mosque immediately beside. The damage to the north-western apartment was extended with a swimming pool excavated through the mosaics of two rooms (see Pl. XLIII, 2), the remains of the northernmost three towers were dismantled on the west side. The northern half of the courtyard was also "cleaned" by the same bulldozer, and the dump pushed in the southern half or beside the mosque (see Pl. XXXVII,1). A part of the "cleaned" area was covered with a new stone pavement. A concrete wall was built

1. The 1983 Mission was organized by Patricia Carlier for her doctoral thesis, presented in December 1984. We are grateful to the Department of Antiquities of Jordan, especially to Dr. A. Hadidi and Dr. F. Zayadine, for their care and support of the Qastal Mission, also organized with the help of the Groupe de Recherches et d'Etudes sur le Proche-Orient (GREPO/CNRS) from Aix-en-Provence and Frédéric Morin.

Under the direction of P. Carlier, the staff included 5 members: Dr. Y. Billaud (geologist), L. Ifrah, S. Metz (students of architecture), V. Morin (agronomist) and F. Morin (architect). The members of the staff were all unpaid volunteers.

2. The 1985 Mission was organized with the help of the Department of Antiquities, who continued

its effort to save Qastal, in addition to the GREPO/CNRS, the French Ministère des Relations Extérieures, the Conseil Régional Provence-Alpes-Côte d'Azur, the Jordanian Embassy in France, the French Embassy in Jordan, RJ, some French telecommunication companies working in Jordan: Cables de Lyon, CIT-Alcatel, Sofrecom, TRT, and Mr. Muhammad J. Shami. Under the direction of P. Carlier and F. Morin for the architectural matters, the staff included 5 members: S. Bacquey and F. Imbert (students of Arabic epigraphy), F. Isler (photographer), E. Ordener and G. Rogier (students of architecture). The members of the staff were all unpaid volunteers.

3. Glueck: *Explorations in Eastern Palestine*. AASOR XIX (1934), p. 5-7.

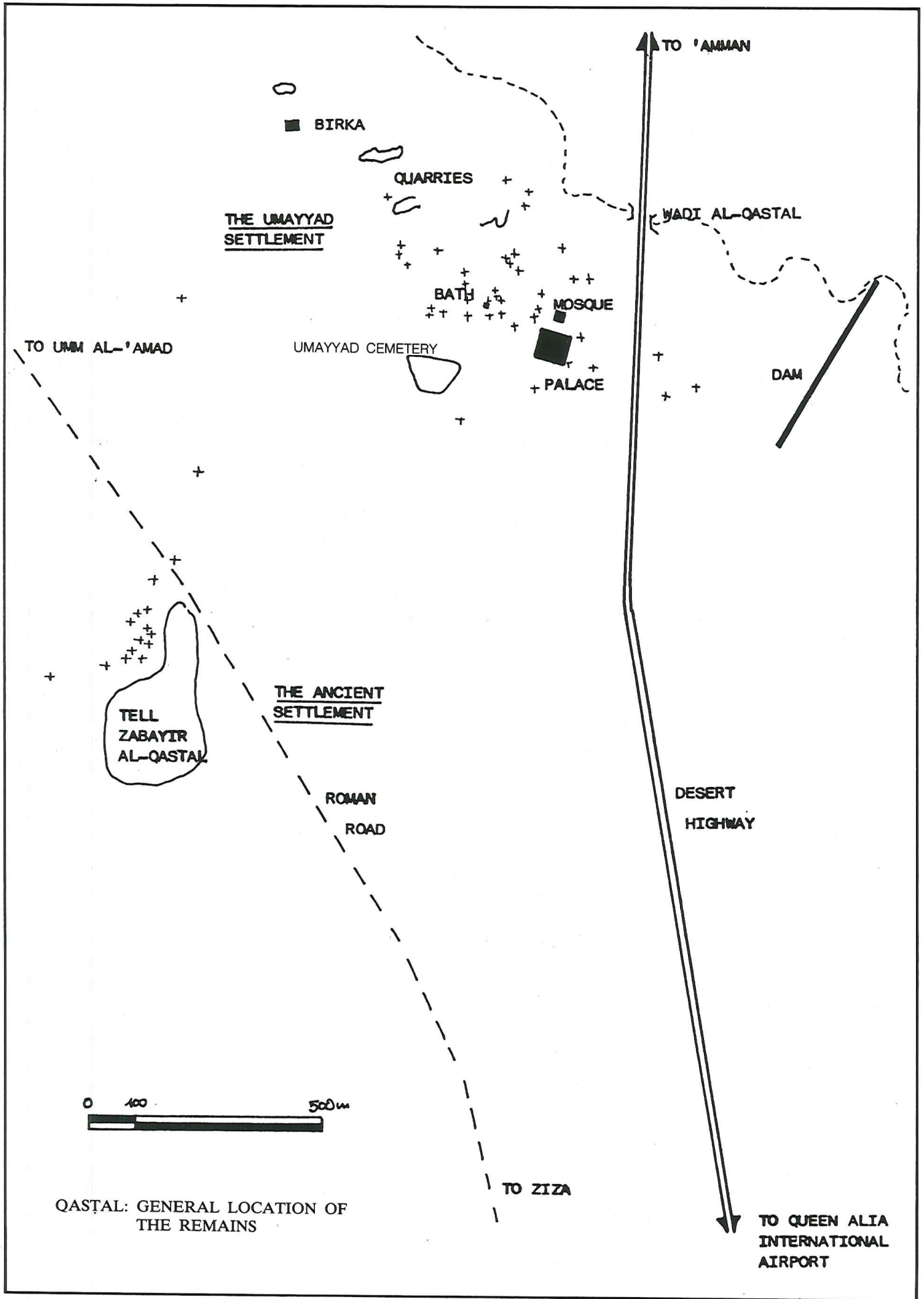


Fig. 1: Qasṭal: General location of the remains.

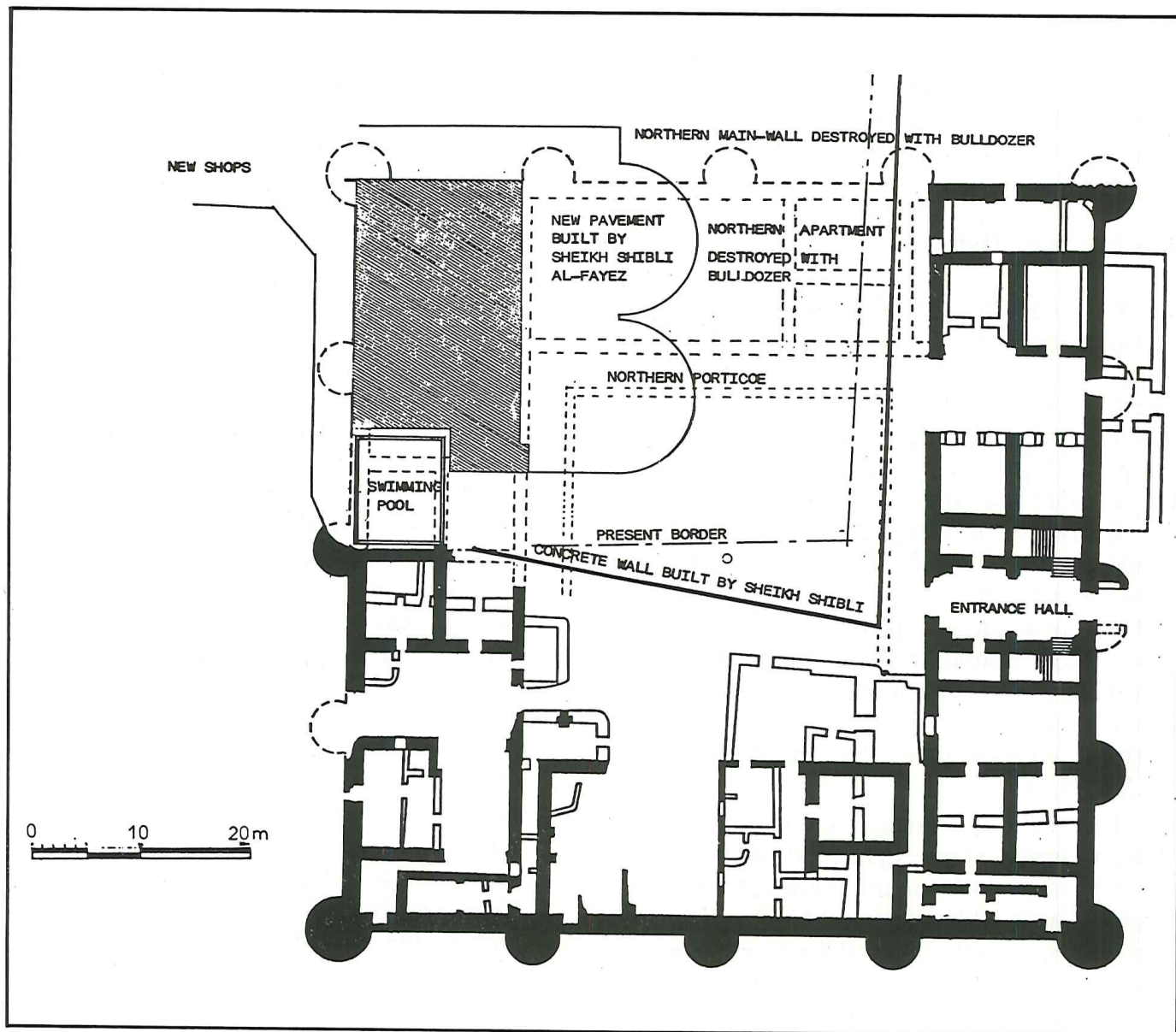


Fig. 2: Qastal: Plan of the remains of the palace in September 1985.

through the courtyard, partly above the foundation of the Umayyad columns, partly on mosaic floors destroyed in the western and northern porticoes, and in the northern apartment. The mosque also suffered from the bulldozer: the eastern wall collapsed, the iron door of the prayer room broke, and the minaret partly collapsed. The remains of the bath were also affected by some transformations of the modern meeting room, built just above it.

In addition to the loss of archaeologic-

al levels, mosaics and architectural remains, several carved blocks were broken (for example the lone column still standing in place in 1983), given away or sold. For example, the NICHE L1, published in our previous article in *ADAJ*⁴, was sent by the Kuwait National Museum (registered in Kuwait under the ref. LNS 655) to the exhibition "LES TRESORS DE L'ISLAM" in Geneva and presented under the number 353-NICHE AVEUGLE- (see the catalogue p. 340).

4. See Carlier: 'Recherches archéologiques au château de Qastal.' *ADAJ* XXVIII (1984), p. 365 Fig. 34; or Carlier: 'Qastal, un château du désert en Jordanie', *Archéologia*, 206, (Nov. 1985), p. 52, and Carlier & Morin: 'Qastal, un site umayyade complet', apud *La voie royale, 9000 ans d'art au royaume de Jordanie*, Paris,

Musée du Luxembourg, 1986, p. 265. The lower part of the block exhibited in Geneva has been cut, certainly for its carving was in very bad condition, but the marks noted on the left acanthus and on the right column ensure the identity of the blocks.

This major destruction obliged us to revise our plans, in order to save what was still to be saved in the palace as well as outside. The dam, the tank, the Umayyad cemetery and the remains in the destroyed area were studied.

The Entrance Hall

During the 1983 mission, the archaeological levels in the Entrance Hall were studied: plastic bags found somewhere directly on the Umayyad pavement showed that the stratigraphy was recent in this part. Therefore, we decided to dismantle carefully the Medieval barrel-vault in the Entrance, reusing Umayyad blocks (some carved, some from cupolas). The carved blocks were set aside and studied, and this area, including the two stairways, was cleared, thanks to the Department of Antiquities who provided five labourers and the help of a loader to remove the heaviest blocks (see Pls. XXXVII,2; XXXVIII,1).

The northern staircase is now cleared, rising fourteen steps high. The southern one is blocked up by an undated wall, very carefully built with Umayyad blocks. The gate is also opened, a carved doorjamb can be seen to the left (unfortunately, the right one is missing) (see Pl. XXXVIII,2). The original structure of the six arches supporting two cupolas in the Entrance Hall is now easier to imagine: the northern middle pilaster is standing up to the cornice (see Pl. XXXIX,1).

Outside, the large Umayyad tower was first dismantled or destroyed, and then completed with a structure, probably vaulted, built with Umayyad blocks — some of which are carved — creating an outer room. The great number of Ayyubid-Mamluk sherds, in addition to the remains of a hearth with a Mamluk pot (found *in situ* in the place of the missing north doorjamb), may indicate that this room was used during the Medieval Period. As there was no door between the outside room and the inside barrel-vault, it must be noted that the entrance of the palace changed.

The next mission will continue this

work, clearing the Entrance Hall for a better presentation of the remains. Several blocks from the lower part of the Umayyad tower were recognized, and the reconstruction work will be easy with the help of a loader.

The Eastern Portico

First, the area between the Entrance Hall and the courtyard was excavated: there was no more than 20cm of earth above the pavement, instead of 2m when we left the palace in 1983. Immediately above the Umayyad pavement, which was preserved in a very bad condition, a very thin level including Umayyad, Abbasid and Medieval materials was found.

Afterwards, the area of the eastern portico where mosaics were found was excavated (see plan in Fig. 3). The last level left by the bulldozer — about 30 cm thick instead of 4m when we left the palace in December 1983 — was exclusively Medieval, but no level of occupation was recognized out of the simple reuse of the Umayyad mosaics, here protected with a stone bench and there affected by a fire. Numerous beam-holes noted in the highest part of the eastern wall of the courtyard may indicate the level of the Medieval roofing in this part, after the collapse or destruction of the Umayyad portico.

The mosaics of the eastern portico were cleared for the complete width of the portico (i.e. 3.20m), around five meters in width. Excepting a local destruction (around one square meter), it seems that this mosaic was entirely preserved (at least until October 1985) (see Fig. 4 and Pls. XXXIX,2; XL,1).

The pattern is identical to the one uncovered during the 1983 mission at the southern portico (south-west corner) (see Fig. 5). The former has circles alternating with squares parallel to the walls, instead of the latter which mixes the same circles with smaller squares, turned 45°. The eight colors are the same, that is white, grey, black, red, pink, orange, yellow and light green, organized in colored stripes using five cubes, for example black, red, pink, white and black. The different colored

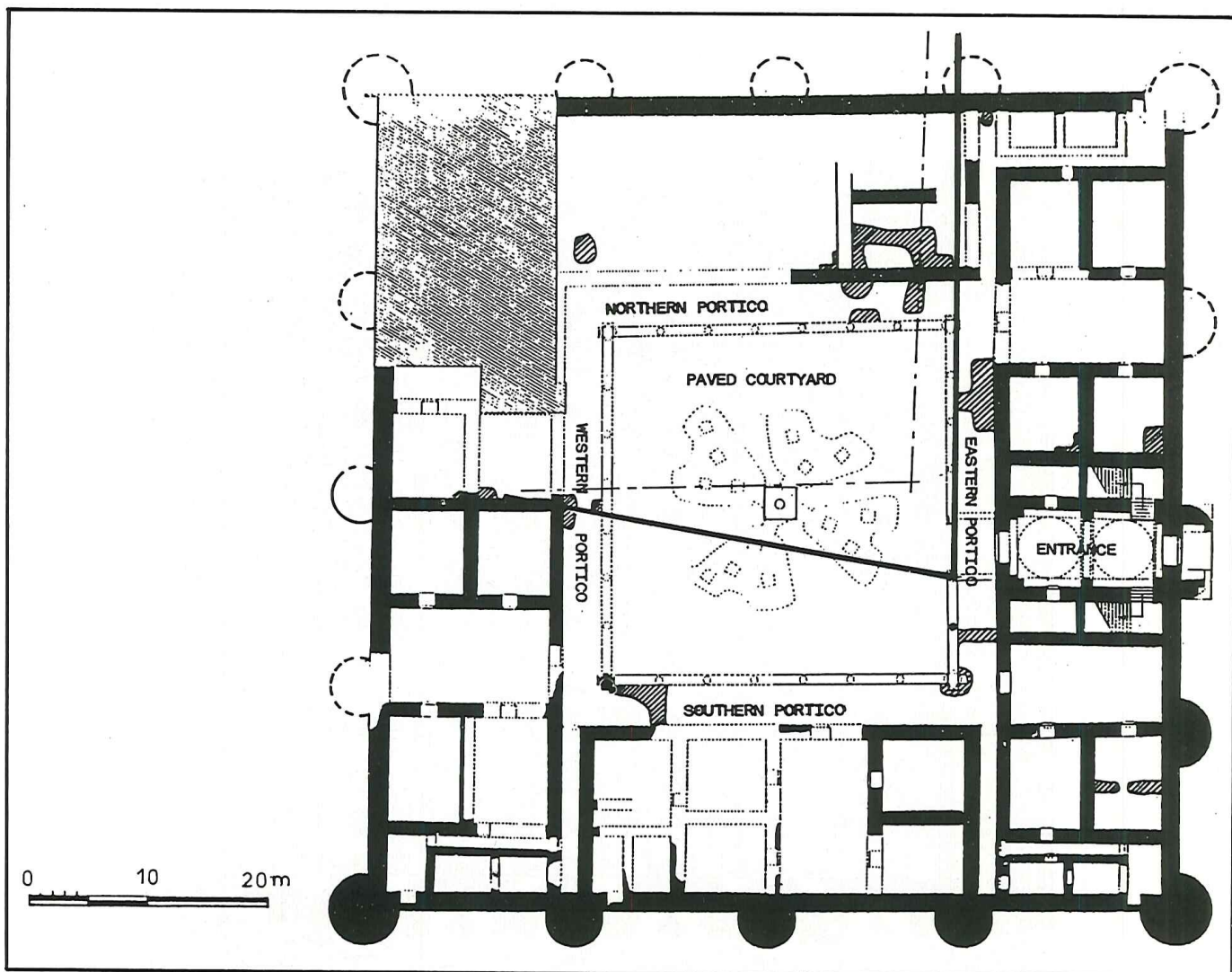


Fig. 3: Qaṣṭal: Location of the remains of mosaics uncovered at the palace during the 1983 and 1985 Missions.

stripes are woven around the circles and squares.

The borders, running along the walls or the foundations of the columns, are also alternating circles and squares woven with two colored stripes. The same pattern was used at the western portico, but its central part has not been recovered yet: the northern half of this portico was destroyed or covered by the construction.

The Northern Portico

After an argument between Shibli al-Fayez, a representative of the Lands Authority and the Department of Antiquities, represented by Dr. Fawzi Zayadine and Mr. Taysir 'Aṭṭiyāt, we were allowed to explore the remains of the northern portico and apartment.

The mosaics of the northern portico were in a very bad state of preservation, and only few parts were found. Although very similar, the pattern differs from the other mosaics. In the central part, the pattern is composed with circles only, drawn with the same colors, but here entangled (see Pl. XL,2 and Fig. 6). The borders also differ: three stripes are braided, and the external side offers a carpet-border, using black, red and orange cubes. This last motif is also used for the borders in the apartments and the corridor leading to the latrines.

The same pattern, entangling circles, was also found by Musil and later by Creswell⁵ at Quṣayr 'Amra, in the alcoves to the left and right of the central apse of the Audience Hall.

5. Creswell: *Early Muslim Architecture, Part One: The Umayyads*. Oxford, 1969.

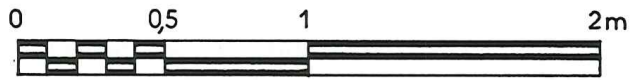
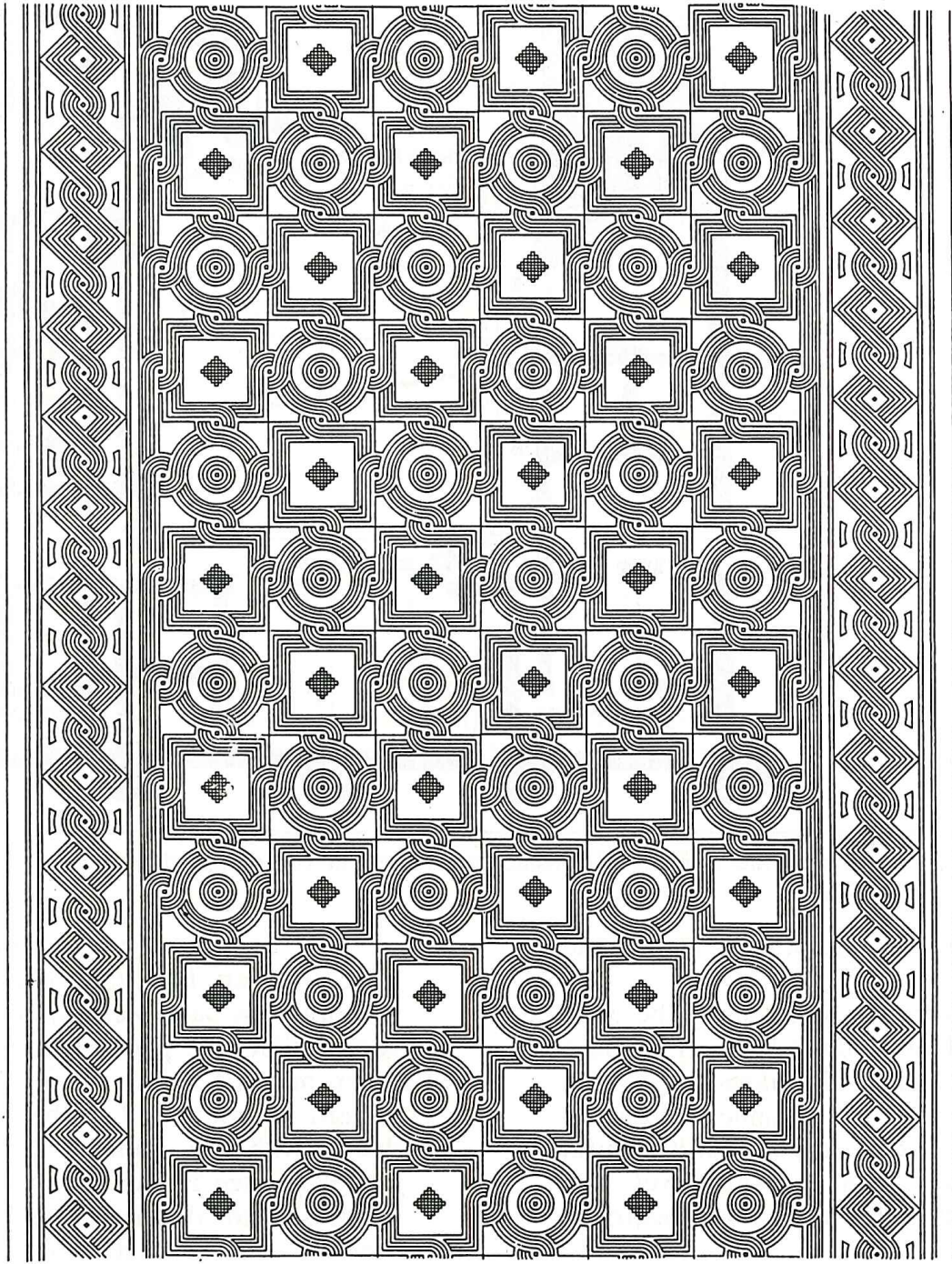


Fig. 4: Qaşta1 1985: The mosaics at the eastern portico. Drawn by G. Rogier.

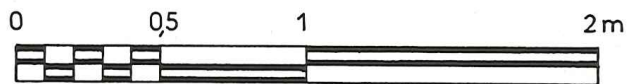


Fig. 5: Qaşal 1983: The mosaics at the southern portico. Drawn by S. Metz.

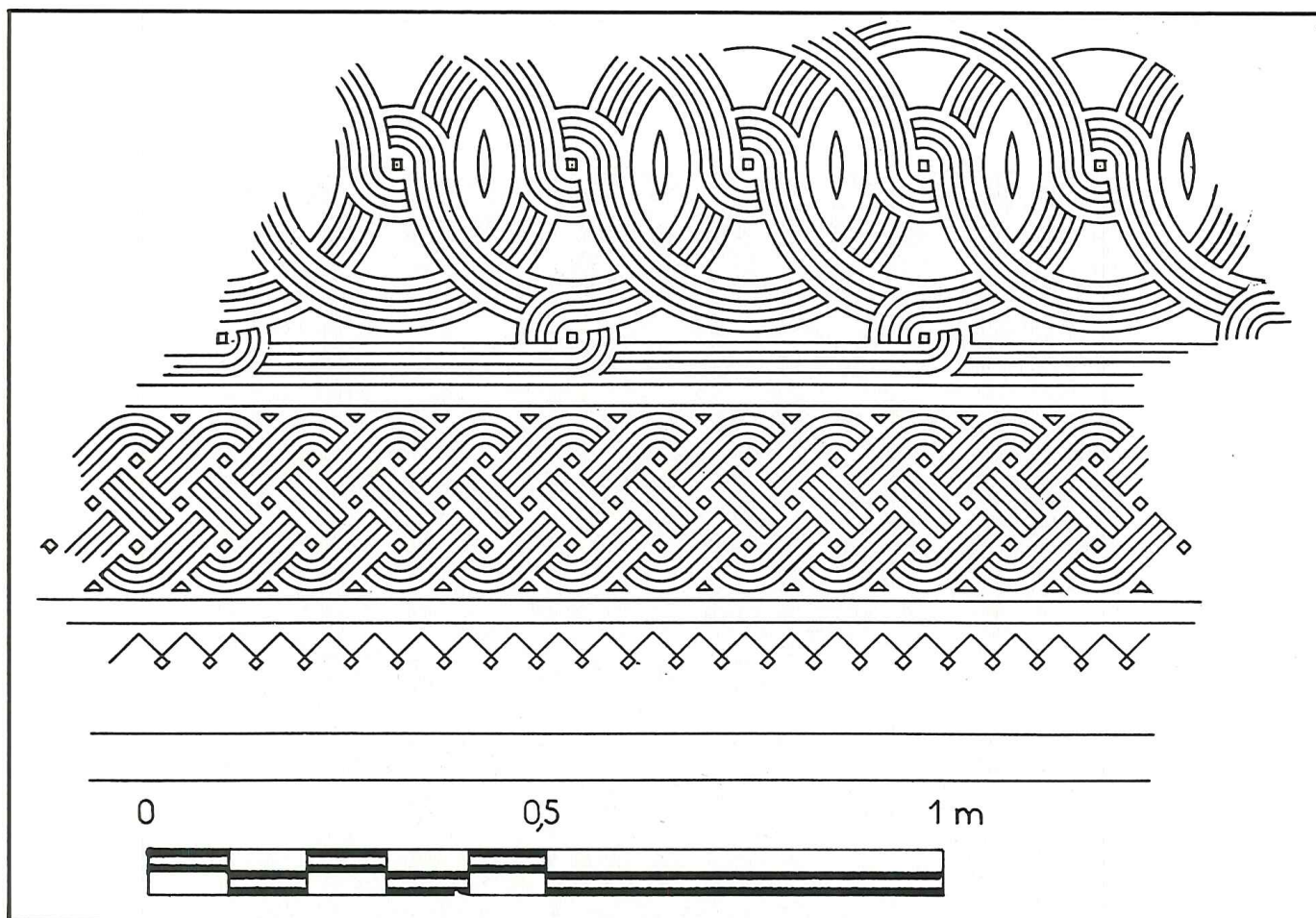


Fig. 6: Qaṣṭal 1985: The mosaics at the northern portico. Drawn by G. Rogier.

The Northern Apartment

In this area, the surrounding wall and towers were completely destroyed, below the level of their foundations (see Pl. XXXVI,1). The first course of the south wall, that is the wall immediately beside the courtyard, was partly preserved. It was a great surprise for us —and also for Sheikh Shibli— to uncover beside this wall, miraculously preserved from the bulldozer, some remains of the finest kind of mosaics at Qaṣṭal (see Fig. 7 and Pl. XLI, 1).

The cubes are about 8 mm wide, instead of the 15 mm width for the mosaics of the porticoes or the other apartments, and more than twelve colours may be noted: white, two greys, black, red, pink, orange, yellow, several yellows and browns, two blues, green.

The borders are divided into three

parts. The outer one reused the carpet-border already mentioned at the northern portico. The middle part is composed of entangled circles, using white, grey, black, red, orange, yellow and yellowish cubes. The inner part offers a red ground, on which appear white squares and polychrome circles, including white, blue, black, yellow and red cubes (see Pl. XLI, 2).

In the central area, the pattern is very complex, entangled large squares (turned 45°). In these squares octagons or circles of different sizes were placed, each ornamented with a rosette, a flower, a leaf or a fruit, painted with a minimum of eight colors (see Pl. XLII,1; 2). It must be noted that the rosettes are identical to those found at Khirbet el-Mafjar in the bath, ornamenting the passage leading to the Throne Room⁶.

6. Hamilton: *Khirbat al-Mafjar, an Arabian Mansion in the Jordan Valley*. Oxford, 1959; Sour-

del: *La civilisation de l'Islam classique*, Paris, 1976, photo no. 124.

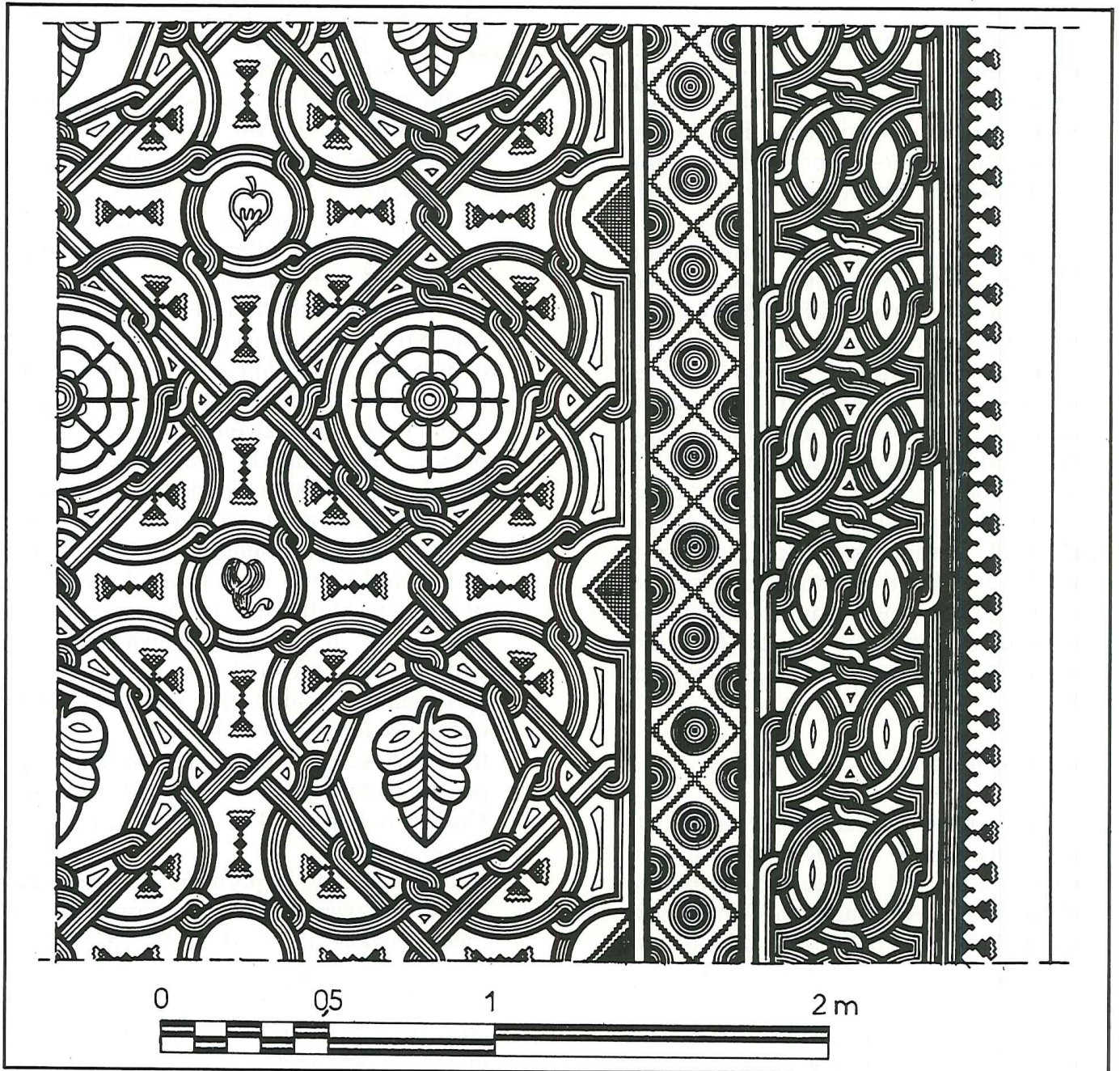


Fig. 7: Qaṣṭal 1985: The mosaics in the northern apartment, east room. Drawn by E. Ordener.

These mosaics uncovered at Qaṣṭal are, through the evidence, related to the finest examples known from the Umayyad Period, to be found at Qaṣr el-Ḥallabat or at the bath at Khirbet el-Mafjar. Unfortunately, very few of them were remaining in 1985 after the work of the bulldozer ordered by Shibli el-Fayez, and we are afraid, after some pictures taken in July 1986 during the epigraphic mission, that these poor remains have been thrown away. If it is possible to obtain the guarantee that these remains of mosaics are still in place, then we would arrange their careful removal.

The Other Apartments

Several local trenches were opened in several areas to check for the presence of mosaics. In the north-eastern apartment, the remains of mosaic floors were uncovered at the two southernmost small rooms. The same observation was made later at the south-eastern, the southern, the south-western and the north-western apartments. Unfortunately, the swimming pool excavated in the latter left only a small triangle in a corner, 50 cm wide, and the mark of the mosaic level on the other walls. In those rooms, the borders only

were preserved.

In the north-west and north-east corridors leading to the latrines directly from the courtyard, a very simple mosaic floor was uncovered, consisting of a white ground with border-carpet motives, using black, red and orange cubes (see Pl. XLIII, 1).

The section cut in the earth by the bulldozer for the swimming pool allowed us to check the Umayyad foundations in a representative proportion (see Pl. XLIII, 2). Under the mosaics, several building levels were noticed: under the last white mortar is a grey concrete, mixed with some cubes. Underneath, two different levels of masonry rest directly on the *ḥuwwar*, the natural and virgin soil. Around the swimming pool, before its foundation trench was filled by Shibli's workers, we verified that no sherds were found under the Umayyad foundations, under the surrounding wall as well as under the internal walls.

The Central Cistern

Around the opening of the main cistern, at the centre of the courtyard, an Umayyad level was recognized during the 1983 mission. Although this area was "cleaned" by the bulldozer, careful excavation of the last centimeters was possible.

Around the brink of the cistern and excavated in the stone pavement, a small canal ran, collecting the waters from the courtyard and from the upper part of the brink itself. There was a water collector, filled with sand. Two glass mosaic cubes were found in this level, one with gold. On the upper face of this level was an Umayyad pot, found crushed *in situ* (in some 190 pieces), mixed with other Umayyad sherds and stone mosaic cubes. Several observations were noted:

a) the first level contains exclusively glass mosaic cubes;

- b) the glass cubes belong to the decoration of the palace, probably somewhere in the Audience Hall;
- c) the Umayyad pot was broken in antiquity, and not by the bulldozer;
- d) the canal was not cleaned after the first damage to the glass mosaics;
- e) the pot was crushed — and left broken — some time after the first degradations of the glass mosaics.

According to Abu'l Faraj al-Iṣfahani, who wrote three centuries afterwards⁷ and al-Ṭabari⁸, the Khalif al-Walid II and his cousin al-'Abbas stayed at Qaṣṭal, that would have been between 743 and 745: the palace — including the courtyard — is supposed to have been cleaned at that time.

The Umayyad pot may have been crushed by some falling blocks: Brünnow and Domaszewski mentioned the remains of a collapsed structure in the center of the courtyard⁹. It is well known that the country was affected by an important earthquake, around the year 747. This earthquake may have been the origin of the collapse, as well as the usually supposed destructions at the end of the Umayyad Period. The first hypothesis is more probable.

Then, if our hypothesis is correct, the sandy Umayyad level corresponds to the time between the end of the period al-Walid II or al-'Abbas inhabited Qaṣṭal and the earthquake, that is between 744/745 and 747. During this gap, some glass mosaics at least were partly destroyed. It is possible to imagine that somebody was inhabiting the palace: the cistern was still in use, for the Umayyad pot was left at the end of this gap.

After the crushing of the Umayyad pot, whatever the cause, Qaṣṭal was not abandoned: two graves, dated from the Early Abbasid Period, were discovered at the cemetery, beside Umayyad tombs. But is there any reason for any damages to the glass mosaics before the earthquake at the end of the Umayyad Period? Those first

7. Al-Iṣfahani, Abu'l Faraj: *Kitab al-Aghani*. Cairo, 1952, VII, 25.

8. Aṭ-Ṭabari: *Tarikh aṭ-Ṭabari*. Cairo, 1972, II,

1784.

9. Brünnow & Domaszewski: *Die Provincia Arabia*, II. Strasbourg, 1905, p. 95-105.

destructions may also be related to the well-known political and economical crisis at the end of the reign of al-Walid II and his murder.

The Staking Out of The Palace

From a discussion after the first publication concerning laying out procedures at Qasṭal¹⁰, it seems that the use of a 0.4520m value for the Umayyad Cubit at Qasṭal is to be assumed, although this value does not belong to the fork given by the water-gauge at el-Muwaqqar (see Figs. 8-9).

The southern and western walls — first laid out — are both 67.80m long: that would be 150.000 x 0.4520m rather than 150.66 x 0.45m as we wrote before. Combining the 0.53m Cubit — maybe an Umayyad value of the Abbasid Black Cubit — and the 0.63m Cubit with the 0.452m Umayyad Cubit, the different operations of the laying out procedure at the palace at Qasṭal were the following:

- a) laying out of the south wall, 67.80m long, that is 150.000 x 0.452m;
- b) staking out of the northwest corner 67.80m = 150 Umayyad Cubits distant from the southwest corner and 95.00m = 150.79 x 0.63m from the southeast corner. The southwest angle is not 90° but 89°, a value which was verified on the remains, and the error made by the builder is 0.52%;
- c) staking out of the northeast corner, 67.43m = 149.18 Umayyad Cubits from the northwest corner and 68.51m = 151.57 Umayyad Cubits from the southeast corner. The difference is due to the Entrance Hall on the east side of the palace, which disturbs the organization of this part. The maximum error is 1.03% on the east side, which is quite reasonable;
- d) laying out of apartments: the general proportion of the northeast apartment is two square each, measuring 35

Umayyad Cubits each. The group of five rooms is a rectangle measuring 50 Umayyad Cubits in length and 50 Black Cubits (0.53m Cubit) diagonally. The central larger room is set out with the same system combining the Umayyad Cubit and the 0.53m Cubit (Black Cubit) for triangulation.

The Dam

The dam is located half a kilometer east of the palace. Oriented northeast/southwest, the remains of the wall are 400m long, and Wadi el-Qasṭal had gone round by the northern end of the wall. Today, the waters of Wadi el-Qasṭal are collected through a wide surface, exceeding 70 square kilometres.

A cross-section was made in the northern part of the dam (see Fig. 10 and Pl. XLIV,1). Very carefully built of large ashlar in headers and stretchers, the wall is 4.30m wide, the central part is filled with masonry. The two first courses offer a recess, 12cm on the west side and 15/17cm on the east side of the wall. Then, the base of the wall is 4.86 m wide. Underneath is the foundation, 85cm wider than the wall on the west side, that means that the total width of the foundation may exceed 6.56m. At that place, the total height of the remains is 2.19m: most of the wall was dismantled by the Ottomans for the construction of the Hijaz Railway.

The usual calculations of the height of water and the construction of such walls allowed the estimation that the height of water was triple the width of the wall. If correct, this calculation would indicate that the maximum depth of the water exceeded 12m, but the study of the contour levels around the dam shows that the wall would not end! Starting from the hypothetical height of water being twice the width of the wall, that is 8m, then the dam might exceed 700m in length and may have contained over 2,000,000 cubic meters. This wall

10. Carlier & Morin: 'Recherches archéologiques au château de Qasṭal', *ADAJ* XVIII (1984), p. 347-348 and Figs. 49 to 53, p. 369-370. Morin:

'L'architecture du château de Qasṭal', *Archéologia*, 206 (Nov. 1985), p. 54-55.

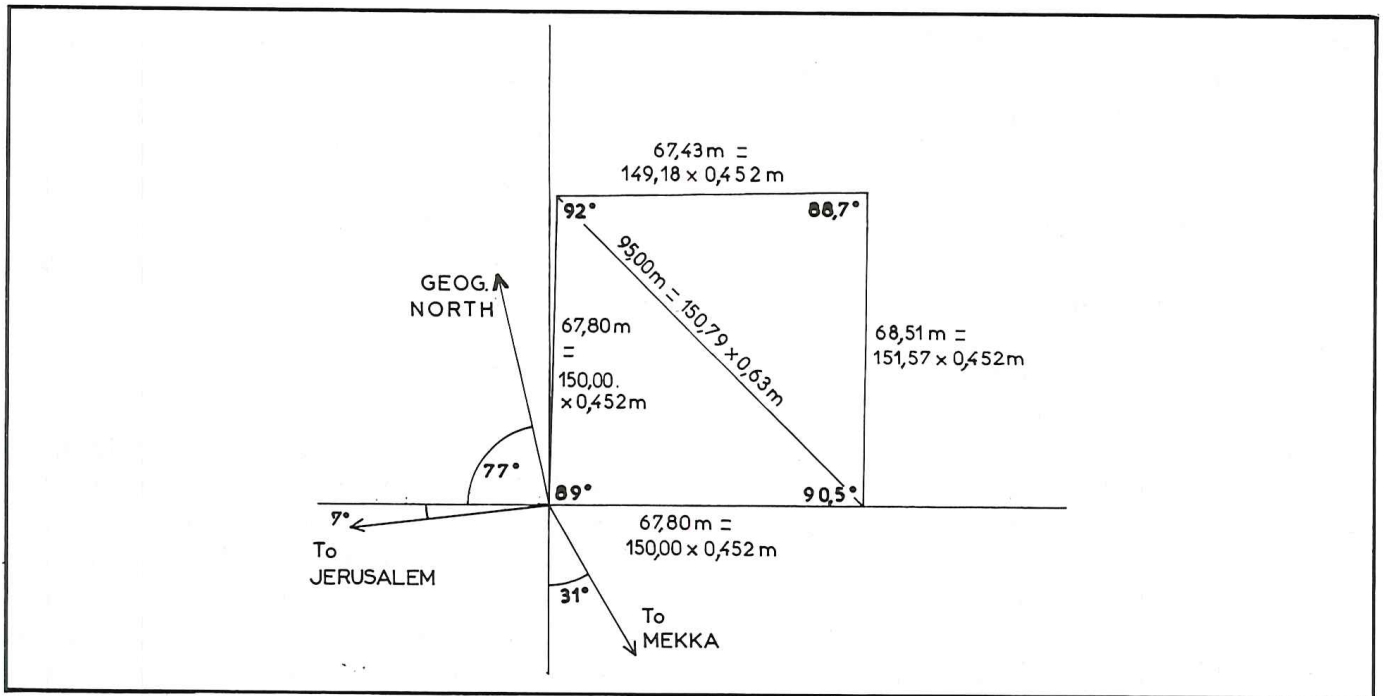


Fig. 8: Qasṭal: Restored staking out procedure of the palace. F. Morin.

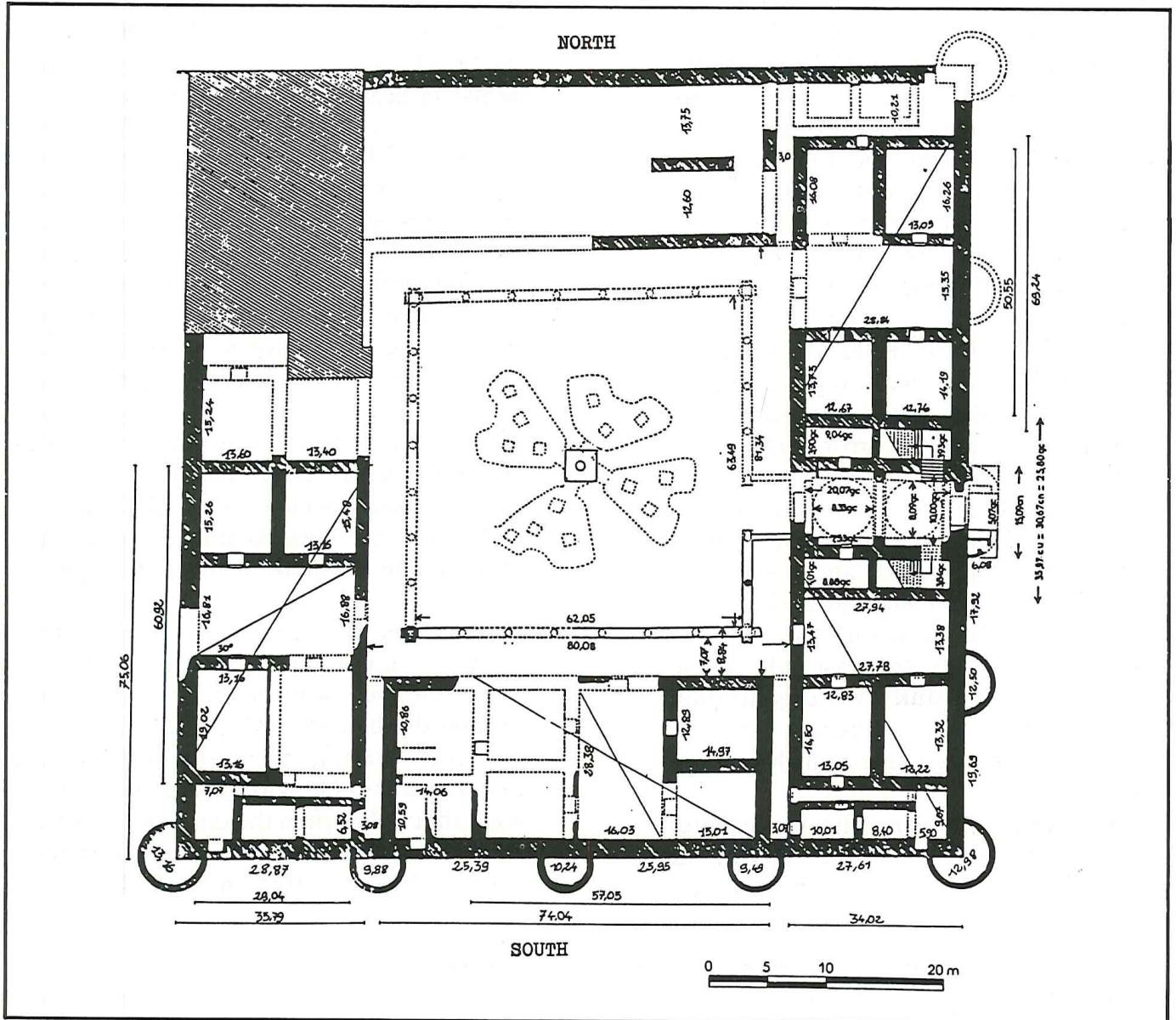


Fig. 9: Qasṭal: The use of the 0.452m Umayyad Cubit at the palace. F. Morin.

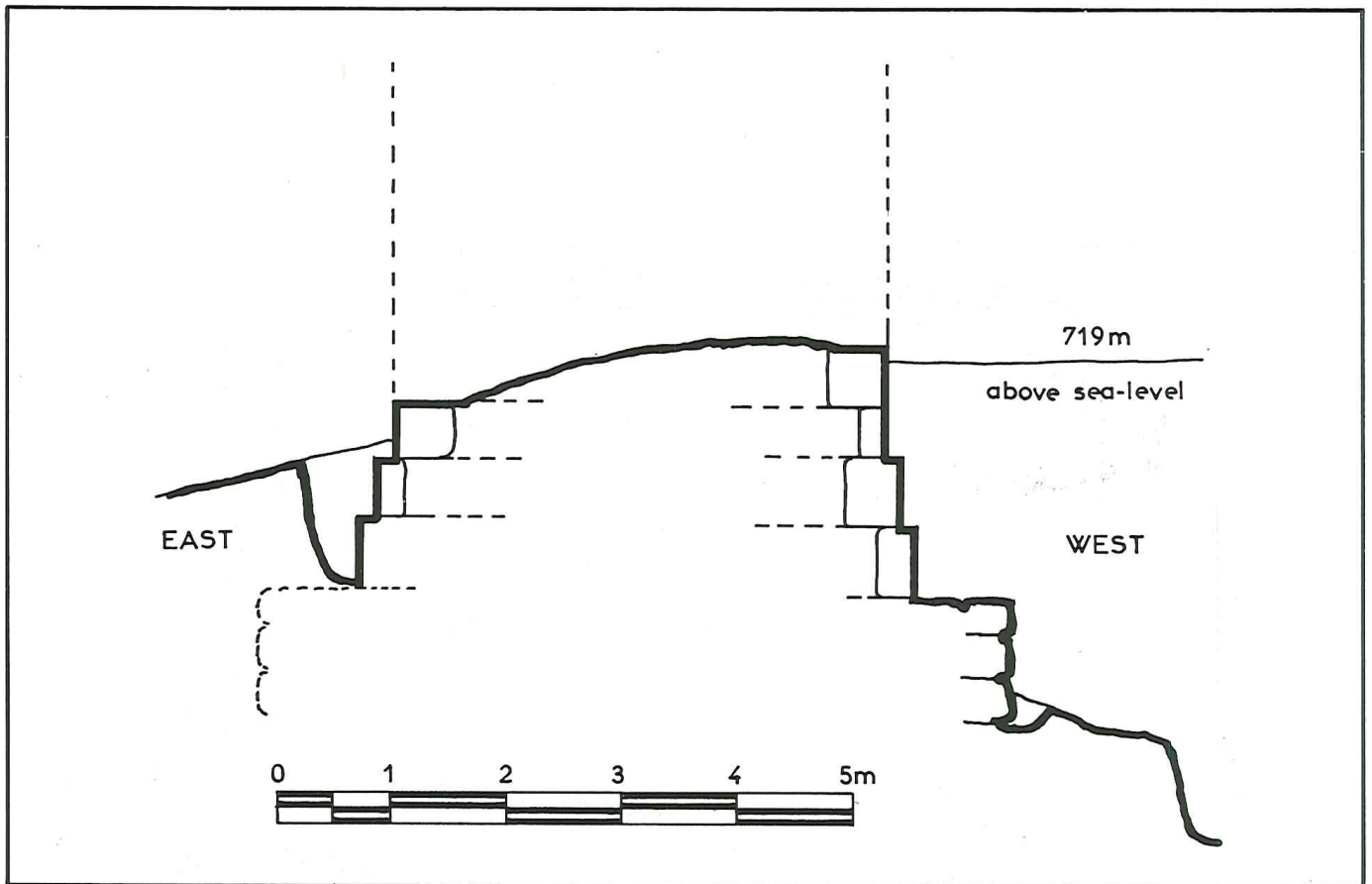


Fig. 10: Qasṭal 1985: Section of the dam. F. Morin.

might also represent over 21,000 cubic meters of masonry. The mortar, including numerous pieces of charcoal, is strictly identical to the mortar used at the palace and at the mosque, and the stone came from the same quarries, north-west of the palace. It must be assumed that the dam also belongs to the period of construction of the palace and the mosque.

The North-West Tank

The north-west tank or *birka* reused one of the numerous quarries opened for the construction of the palace, the mosque and the dam. The tank is roughly rectangular in plan, about 30m long and 22m wide (see Figs. 11-12). On the west side, a stairway leads down the reservoir, 6.50m deep. The northern side was raised with some courses: four of them remain. The sides were waterproof coated, but most of this coating is now missing.

The water was collected on the upper part of the hill by two canals, running from the south-east and south-west corners (see Pl. XLIV,2). The total quantity of water

kept by the tank may have exceeded 4,000 cubic meters. Although the collecting system is out of use, the tank usually contains 50cm of water in spring, and some remains until July.

Implanted at the center, a water-gauge was standing: still in place in September 1985 (see Pl. XLV,1), the base of the column was pulled out during the winter of 1985-1986. Beside the standing base, a long shaft lies in the mud, and another drum is missing (recently stolen). Unfortunately, this water-gauge does not bear any inscription or graduation, but its shape is rather interesting.

The grooved column is 0.53m in outside diameter, but 0.45m in inside diameter (see Fig. 13). The grooves are also 0.53m in diameter, and some other values must be noted on the section. The 0.45m and 0.53m units were already mentioned in our study of the laying out procedure of the palace (see above). This 0.45m Cubit seems to be the Umayyad Cubit (0.445m/0.45m) found at the tank at el-Muwaqqar, associated with an inscription dated 104H./722-3, from the time of Yazid II (719-

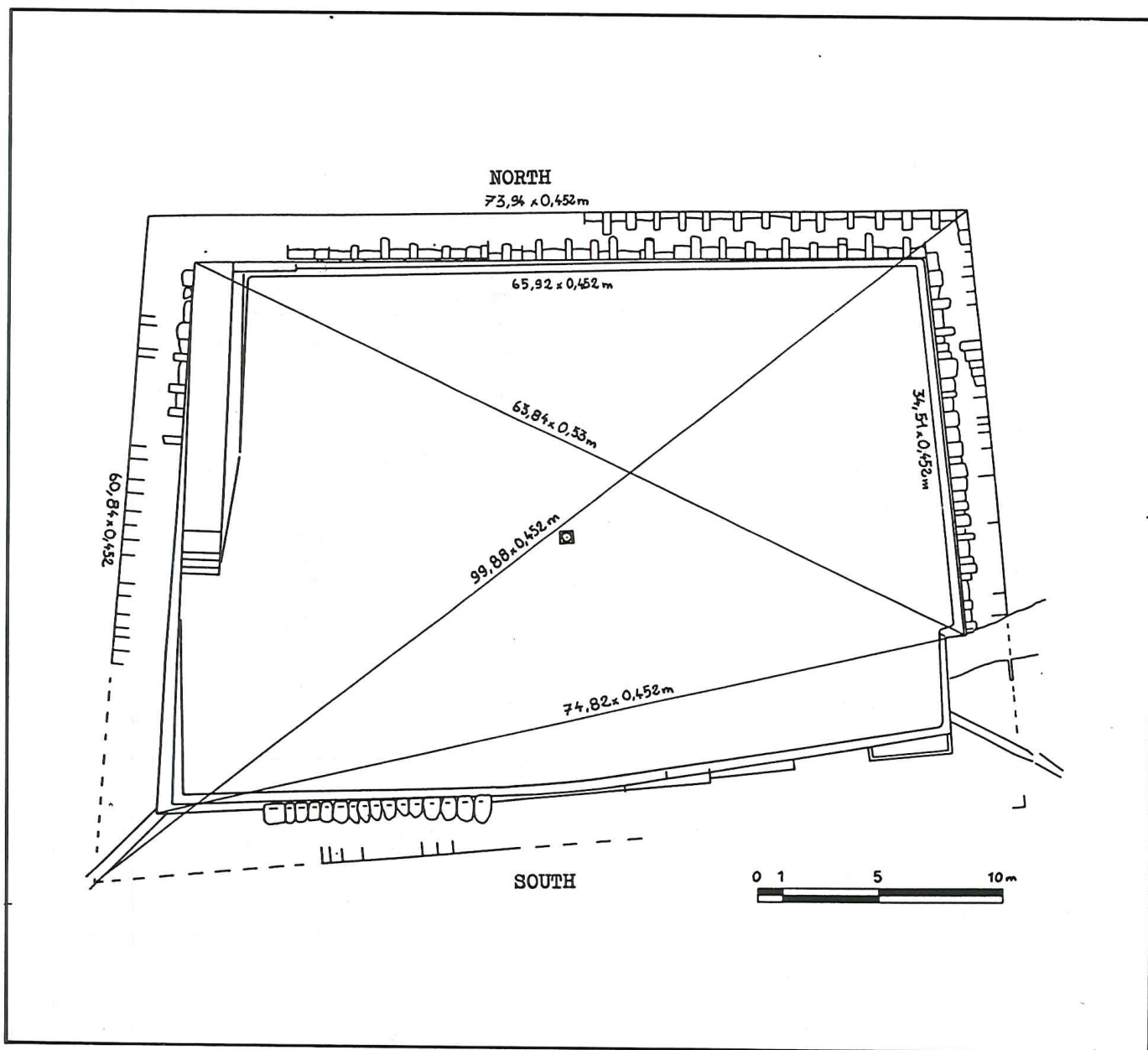


Fig. 11: Qasṭal 1985: Plan of the north-west tank. F. Morin.

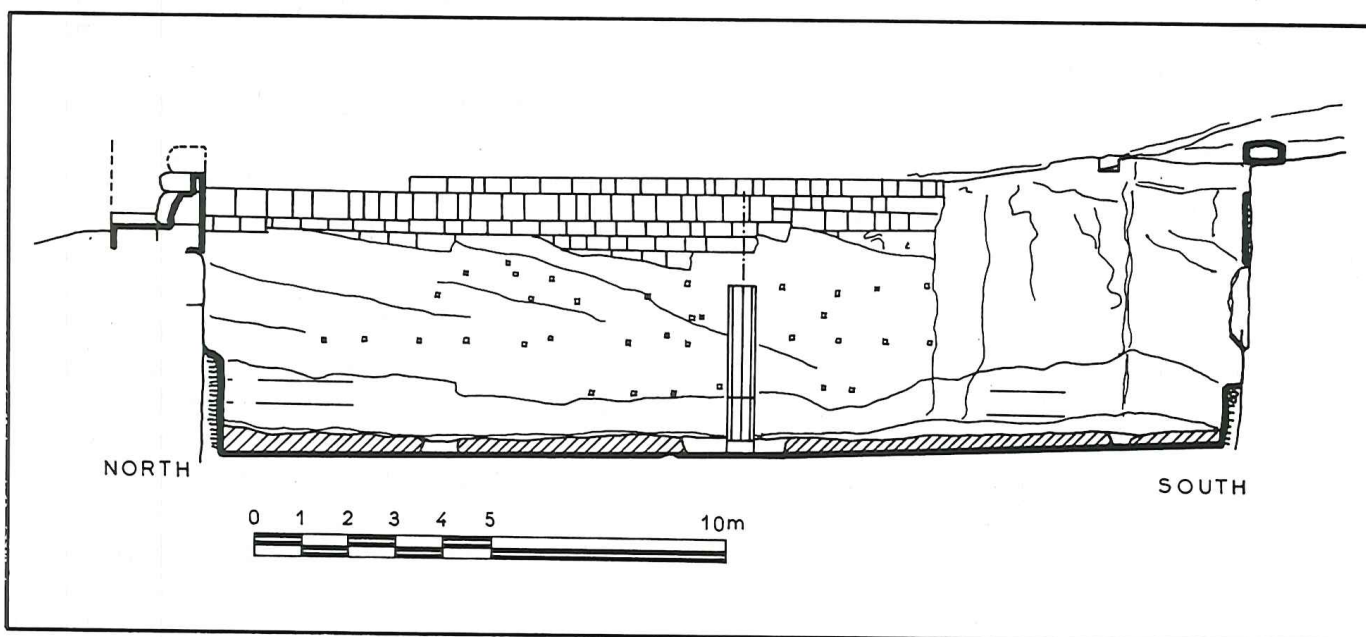


Fig. 12: Qasṭal 1985: Section of the north-west tank. F. Morin.

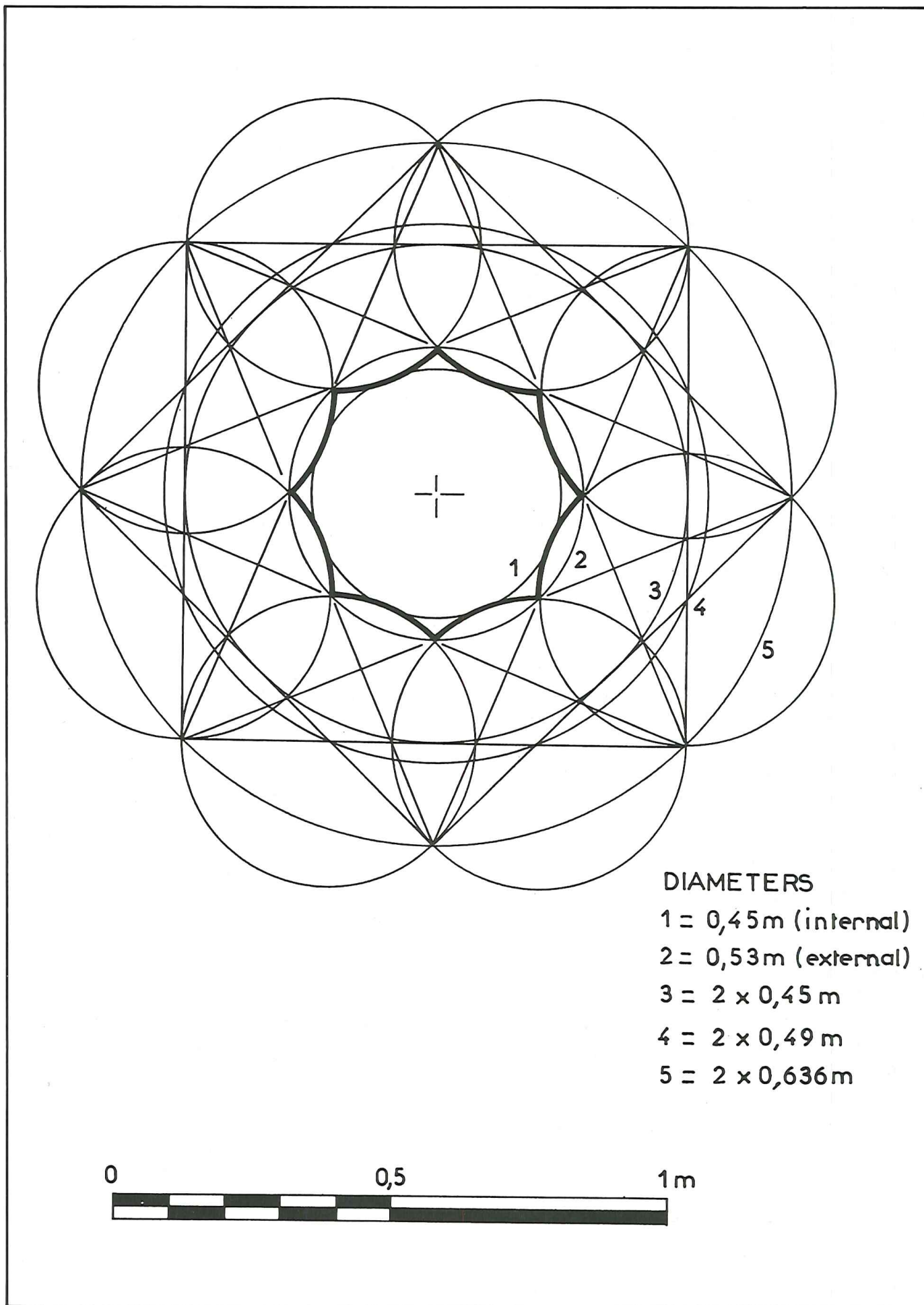


Fig. 13: Qaṣṭal 1985: Cut-section of the drum of the water-gauge. F. Morin.

724)¹¹, and we consider that the 0.53m unit may be an Umayyad value of the Abbasid Black Cubit.

Thus, the section of the water-gauge found at Qaṣṭal is important for the geometrical relation established between the Umayyad Cubit and the Umayyad value of the Black Cubit: here is the explanation of the deformation offered by the plan of the mosque (see below).

It must be noted that the lowest level of filling of the tank contains Umayyad sherds exclusively, and we must assume that the tank also was built and used during the Umayyad Period.

The Umayyad Cemetery

The Umayyad cemetery was discovered by S. Bacquey and F. Imbert, south-west of the palace. Fourteen inscriptions were found in September 1986, eleven of them were moved to the Museum at Madaba, with the help of Mr. Tayseer Aṭṭiyāt. During an epigraphic mission in July 1986¹², three other stelae were discovered¹³.

It must be noted that two inscriptions date from the Abbasid Period, beside most of the others which belong to the Early or Late Umayyad Period. Careful planning of the cemetery and its general orientation shows that some tombs were set on a line perpendicular to the direction of Mekka, as usual, but several others were set on a line running through Jerusalem, without any error (see Fig. 14).

The Mosque

After the ever growing importance of the destruction, we asked the Department of Antiquities to allow some research at the mosque: Shibli al-Fayez was persuaded that it was a church, without any importance.

First, a small trench was opened in the courtyard, beside the late western door, but the stratigraphy was recent in this part. The level of the Umayyad floor was not reached. Some pictures taken in July 1986 during the epigraphic mission show that this first trench was completed, between winter 1985 and spring 1986, by another trench opened by unknown people.

Second, we decided to take up very carefully (at the scale of 1/50) the plan and an axial section of the mosque, before its probable destruction (see Fig. 15-16). From the architectural study, it appears that the prayer room was first opened on the courtyard, through three arches: their springings are still in place, and the key-stones can be seen around the mosque. The central arch was 5.07m wide, that is 8.04 x 0.63m. The west arch is 3.00m wide, and the pillar in between is 2.67m wide, i.e. 5.03 x 0.53m.

The outside measurements of the mosque differ slightly from those measured on the plan published by Gaube:

- diameter of the minaret: 5.00m = 7.93 x 0.63m (i.e. an error of 0.87%);
- general width (north and south walls): 17.95m = 39.88 x 0.450m or 39.71 x 0.452m (40 Umayyad Cubits, the error is 0.3%);
- northwest/southeast diagonal of the courtyard: 21.30m = 40.18 x 0.53m (40 Black Cubits, the error is 0.45%).

Thus, the courtyard of the mosque was set out using the procedure already explained concerning the apartments of the palace: the long side of the rectangle was measured using the Umayyad Cubit, and one of the diagonals using the 0.53m Cubit (Black Cubit). But at first we were not able to record this procedure at the prayer room: the south wall (*qibla*) should have been 1.50m south of the present one.

Therefore, we decided to open a trench outside the mosque, and there we

11. Creswell: *op. cit.*, p. 496.

12. This Epigraphic Mission was organized by the Groupe de Recherches et d'Études sur le Proche-Orient (GREPO/CNRS), in collabora-

tion with the Department of Antiquities and the American Center of Oriental Research (ACOR).

13. S. Bacquey and F. Imbert: 'Le nécropole de Qaṣṭal', *ADAJ* XXX (1984), p. 397-404.

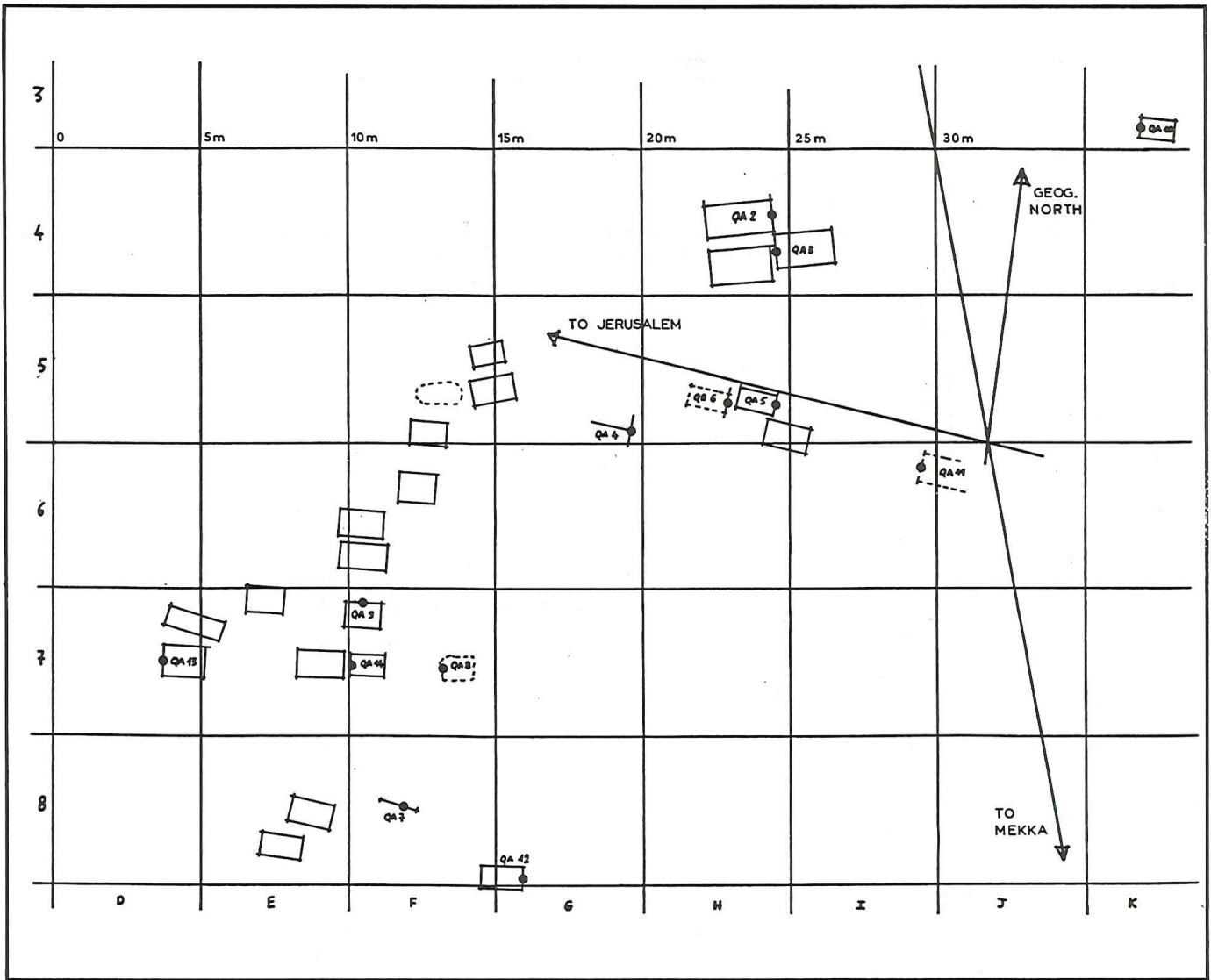


Fig. 14: Qasṭal 1985: Plan of the Umayyad cemetery. F. Morin, G. Rogier, E. Ordener

uncovered the original *qibla*, 1.55m south of the present one as expected (see Pl. XLV,2). Two *miḥrabs* can be seen: the latest is a circular niche, roughly built and reusing the original *miḥrab*: a rectangular recess 0.45m deep (one Umayyad Cubit) and 1.80m wide (4 Umayyad Cubits). Thus, the outside measurements of the original prayer room are:

- width (*qibla*): 17.95m = 39.71 x 0.452m (40 Umayyad Cubits);
- depth: 10.55m = 19.90 x 0.53m (20 Black Cubits, the error is 0.5%);
- southwest/northeast diagonal: 21.25m = 40.09 x 0.53m (40 Black Cubits, the error is 0.22%);
- total length: 22.75m = 50.33 x 0.452m (50 Umayyad Cubits, the error is 0.66%).

The operations of the laying out of the mosque were:

- a. layout of the *qibla*, 40 Umayyad Cubits long;
- b. staking out of the northeast corner of the prayer room, 20 Black Cubits distant from the southeast corner and 40 Black Cubits distant from the southwest corner of the prayer room: here is an exact application of trigonometric laws;
- c. prolongation of the east wall of the prayer room, up to a length of 50 Umayyad Cubits;
- d. staking out of the northwest corner, 40 Umayyad Cubits distant from the northeast corner of the mosque and 40 Black Cubits distant from the northeast corner of the prayer room (also the southeast corner of the courtyard).

It is to be noted that the proportions of the prayer room and the courtyard differ, although they were both staked

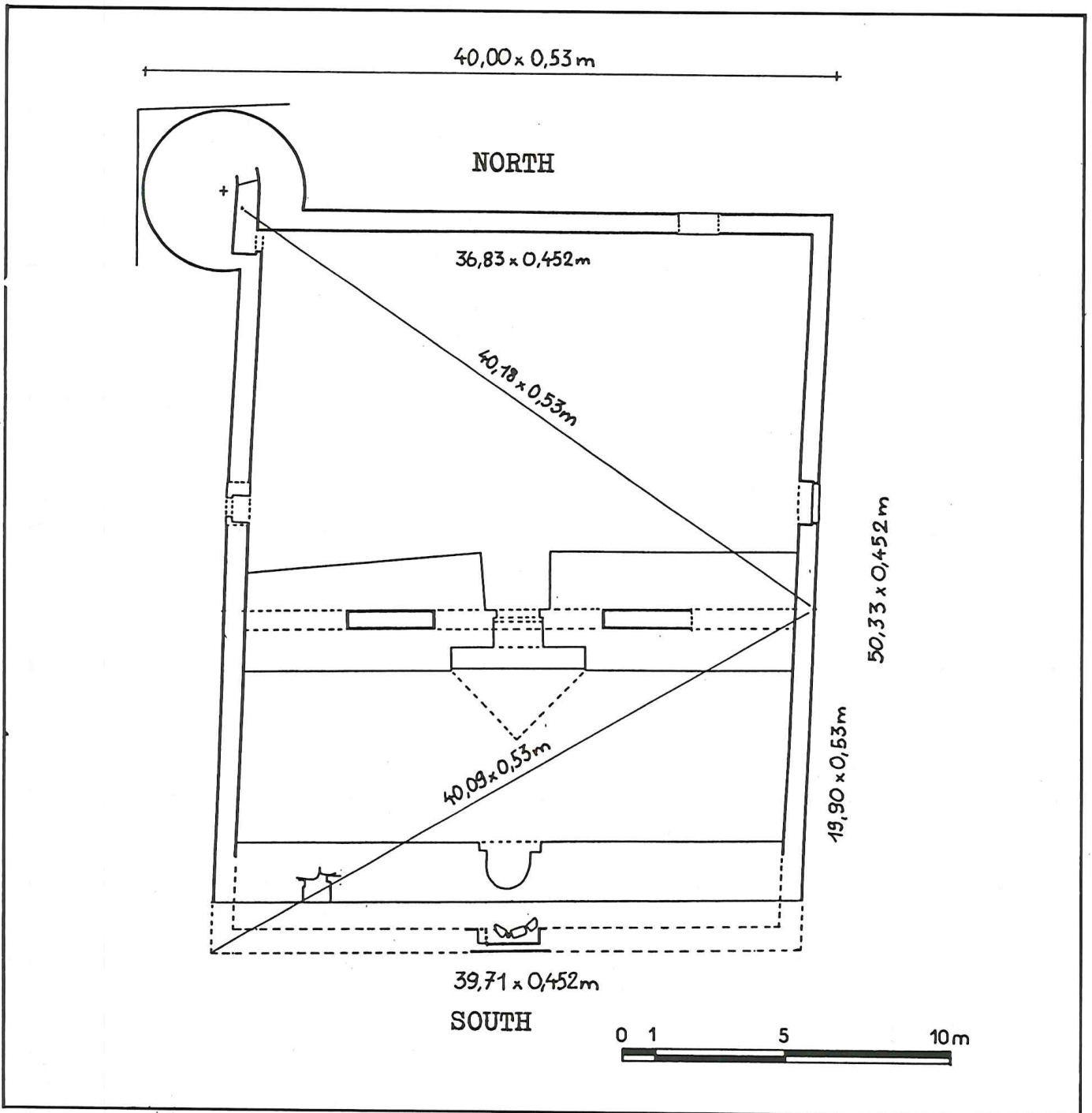


Fig. 15: Qaşal 1985: Plan of the mosque and the staking out procedure. F. Morin.

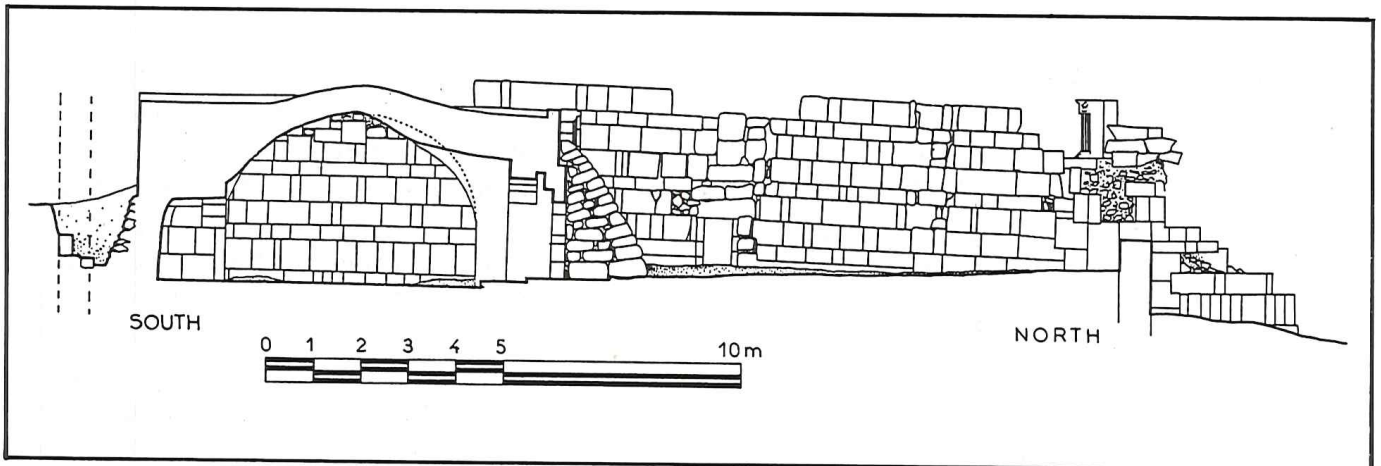


Fig. 16: Qaşal 1985: Axial section of the mosque. G. Rogier, E. Ordener.

using a combination of the Umayyad Cubit and the Black Cubit: the shape of the former is based on the use of the trigonometric relationship affected by the error between the two cubits, in contrast to the courtyard where the depth was not verified. On the other hand, it must be noted that the *qibla* wall is not perpendicular to the direction of Mekka: the error is 29° West.

Finally, the mosque at Qaşal differs from the other mosques built around the Umayyad palaces: here, the prayer room is not deep (only one row — as at Qaşr el-Ḥayr el-Gharbi — instead of two at Jabal ‘Usays and three everywhere else); there is a minaret (including stairs), the original *miḥrab* was a rectangular recess, and the *qibla* wall is not perpendicular to the direction of Mekka.

New Hypothesis of Dating

Throughout an half-century survey concerning Umayyad architecture, laying out procedures and building techniques, it appears that the 0.53m Umayyad value of the Black Cubit and the 0.63m Cubit did not change during the Umayyad period, and this observation seems to be confirmed by Hinz who mentioned the 0.63m Cubit at Damascus¹⁴. Although the exact measure varies, we must assume that the outer-walls of Early Umayyad palaces are 150 Umayyad Cubits on each side. Thus, in spite of the perseverance of the 0.53m and 0.63m Cubits, the exact value of the Umayyad Cubit changed from place to place, from palace to palace. The variation of the Umayyad Cubit may be summed up as presented in Table 1.

The actual value of the Umayyad Cubit seems to decrease with time, and this observation would make Qaşr el-Kharana one of the first Umayyad castles, as its exceptional characteristics (scale, building techniques, no mosque on the site...) would also indicate. In the list of buildings above, we were able to restore the laying

out procedures at Qaşr el-Kharana, Qaşal, Jabal ‘Usays and Khirbet el-Mafjar, in addition to the Dome of the Rock, and the mosques at Qaşal, Qaşr el-Ḥallabat, Khirbet el-Mafjar and Umm el-Walid.

Some of these buildings are definitively dated from the Umayyad period: the Dome of the Rock, Jabal ‘Usays, Qaşr el-Ḥallabat, Khirbet el-Mafjar. The fact that it is possible to explain the rectangular plan at Qaşr el-Kharana, and the deformation of the general plan of the palace at Qaşal, by the use of the same concept of laying out procedures which was employed by the Umayyads — recorded at Umayyad buildings — argues very strongly for the Umayyad dating of Qaşr el-Kharana and Qaşal, from the reign of al-Walid I or earlier. Such arguments are to be added to all others, all leading to the same conclusion.

In our detailed paper “Umayyad Measurement in Jordan”, a new hypothesis concerning the staking out of the Dome of the Rock was presented¹⁵, characterized by a better explanation of the measured errors and imperfections. This procedure is based on the 0.4520m Umayyad Cubit used for the staking out of the circle inscribed into the outside wall (49.75m in diameter, that is 110.06 x 0.452m — 110 Umayyad Cubits —, a 0.054% error) and the inside diameter of the central drum, measured at the bottom (20.33m in diameter, that is 44.97 x 0.452m — 45 Umayyad Cubits — a 0.066% error) (see Fig. 17).

The laying out procedure is based on the translation of measures from the 0.4520m Umayyad Cubit into the 0.63m Cubit, or the opposite, mixed with an octagonal design. The constant value of the error measured — never more than 0.03 Cubits measured in radius — ensures that the procedure proposed is correct.

The relationships between the different octagons and the central drum clearly depend on the relationship between the 0.452m Umayyad Cubit and the 0.63m Cubit: theoretically, this ratio would be

14. Hinz: *Dhira'*, apud *Encyclopédie de l'Islam*, t. II, Paris, 1965, p. 238-9.

15. Morin: *Umayyad Measurement in Jordan*, (to be published).

Table 1 The varying value of the Umayyad Cubit throughout Umayyad buildings (F. Morin).

Qaşr el-Kharana	0.4532m,	0.4500m,	0.445m		
Dome of the Rock	0.4520m				
Qaştal	0.4520m				
Jabal 'Usays	0.4502m				
Khirbet el-Minya	0.4500m,	0.4486		and	0.482m
Quşayr 'Amra	0.4500m	0.4480m,	0.445m	and	0.48 m
El-Muwaqqar	0.4500m,	0.4480m,	0.445m		
Average of palaces built by Hisham	0.4500m,	0.4487m,	0.445m	and	0.48m/ 0.49m
Khirbet el-Mafjar	0.4500m,	0.4485m,	0.445m,	0.435m	
Mushatta	0.4500m,	0.4487m,	0.445m	and	0.49m
Qaşr et-Tuba	0.4500m,		0.432m	and	0.48m
Mosque at Qaşr el-Hallabat	0.4500m,		0.445m		
Ĥammam eş-Şarah	0.4500m,			and	0.48m/ 0.49m
Mosque at Khan ez-Zabib	0.4500m,		0.445m	and	0.48m
Mosque at Umm el-Walid	0.4500m,		0.445m	and	0.48m

equal to:

$$\sqrt{2} = 1/\text{Cos } 45^\circ = 1.4142135.$$

The measured ratio at the Dome of the Rock is $0.63 \text{ m}/0.452\text{m} = 1.3938053$.

The study of Umayyad laying out procedures shows the importance of the varying ratio between the Umayyad Cubit and the 0.63m Cubit, as the real but wrong value of $\sqrt{2}$ used during the period of construction. Table 2 shows the varying value of the ratio between the 0.63m Cubit and the Umayyad Cubit, where the laying out procedure has been explained.

From this list (Table 2), it seems that the ratio between the Umayyad Cubit and the 0.63m Cubit was rather inferior to the exact value of $\sqrt{2}$. This measured value seems to increase during the Umayyad Period, until one obtains a ratio very close to the ideal value: around 0.10% of error at the end of the period. This hypothesis

would be confirmed by the evolution of this ratio during the construction of Qaşr el-Kharana: according to the evidence, the decoration was done after the construction, which was begun after the layout. If this hypothesis is correct, the construction of Qaşr el-Kharana (and not the staking out) would be placed between Jabal 'Usays and Khirbet el-Mafjar, according to the value of the 0.63m-Cubit/Umayyad-Cubit ratio used, and there is no problem for the 92 H./710 A.D. inscription to have been painted in the entrance of the castle.

It is also noticed that this improved value of $\sqrt{2}$ measured at the late Umayyad buildings (Khirbet el-Mafjar, Mushatta) corresponds in fact to an improved staking out: the enclosures at Khirbet el-Mafjar (palace, mosque, bath and pool)¹⁶ are at nearly right angles, and new measurements are required to verify the

16. After the plans and measures given by Hamilton: *op. cit.*

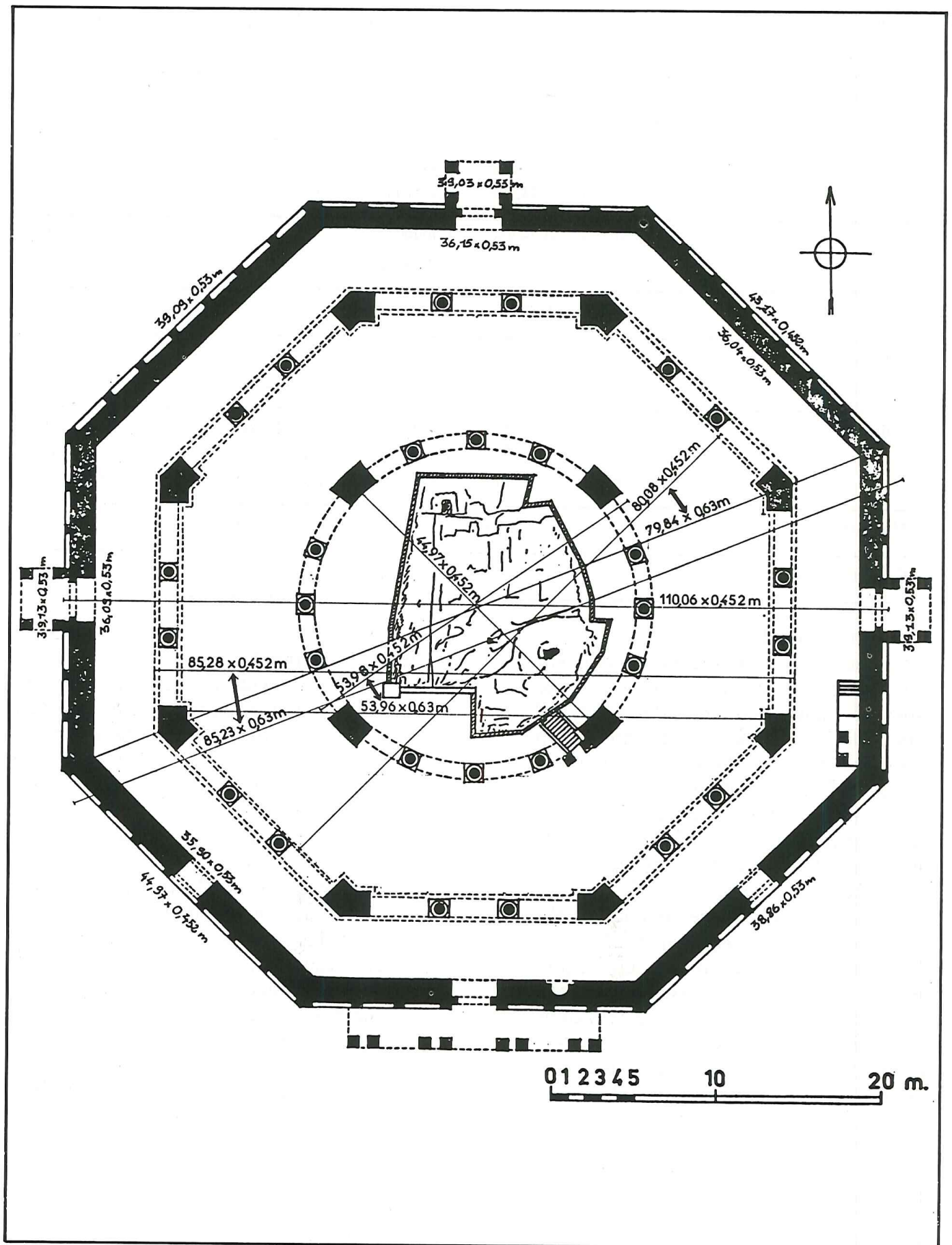


Fig. 17: The Dome of the Rock: The laying out procedure and the use of the 0.452m Umayyad Cubit, the 0.53m Cubit and the 0.63m Cubit. Translation of measures from the Umayyad Cubit into the 0.63m Cubit (after GOLVIN: *Essai sur l'architecture religieuse musulmane*, t.2, Fig. 4).

TABLE 3. THE MEASURED VALUE OF $\sqrt{2}$ THROUGHOUT Umayyad Castles (7th-8th century).

Exact value of $\sqrt{2}$			% Error
	= 1.4142135..		
Qaṣr el-Kharana:	0.63m / 0.4532m = 1.3901147...	implantation	(1.704%)
	0.63m / 0.4500m = 1.4000000...	construction	(1.005%)
	0.63m / 0.4450m = 1.4157303...	decoration	(0.107%)
Dome of the Rock:	0.63m / 0.4520m = 1.3938053...		(1.443%)
Qaṣṭal:	0.63m / 0.4520m = 1.3938053...		(1.443%)
Jabal 'Usays:	0.63m / 0.4502m = 1.3993780...		(1.049%)
Palaces built under Hisham:	0.63m / 0.4487m = 1.4040561...	average	(0.718%)
Khirbet el-Mafjar:	0.63m / 0.4485m = 1.4046822...	layout palace	(0.673%)
	0.615m / 0.435m = 1.4137931...	layout bath	(0.029%)
	0.63m / 0.4450m = 1.4157303...	layout pool	(+0.107%)
Mushatta:	0.63m / 0.4450m = 1.4157303...	subdivision into 3	(+0.107%)
Exact value of $\sqrt{2}$	= 1.4142135...		

same fact at Mushatta.

In the two lists above, there is one pair of buildings characterized by the same values of cubits used (0.4520m Umayyad Cubit, 0.53m Black Cubit and 0.63m Cubit) and therefore the same wrong value of $\sqrt{2}$: in fact, the Dome of the Rock and Qaṣṭal always appear together in such chronological lists. We therefore wonder about the relationship between the Dome of the Rock and Qaṣṭal.

Thanks to Mr. René Saupin, of the French *Institut Geographique National*, who, while working at the J.N.G.C., provided us with a map on which the directions from Qaṣṭal to Mekka and Jerusalem were indicated, we were able to record that the south wall of the palace at Qaṣṭal, the first to be set, was not perpendicular to the direction of Mekka (a 31° W error) but was, rather, set on a line running approximately through Jerusalem (7°N error). The same fact was recorded at the mosque at Qaṣṭal: its south wall is not perpendicular to the direction of Mekka (a 29°W error) but is set on a line running approximately through Jerusalem, with only 5°N of error. The wrong positioning of Jerusalem is 7 km north of the real one, that is

10% of the distance between Jerusalem and Qaṣṭal (68 km).

We have made the same calculations for other Umayyad castles — unfortunately not so exact — from the orientations given by archaeologists and the situation of the buildings, starting with the first wall set (see Table 3).

Several observations are made:

- First, the layouts carried out under the reign of al-Walid II do not seem to be involved with orientation: the error is never less than 12°. Except for Khirbet el-Mafjar, the palaces built under al-Walid II need a new measurement campaign, and very little may be added concerning Late Umayyad orientation.
- Second, Qaṣr el-Kharana, Jabal 'Usays, Qaṣr el-Ḥayr and Ruṣafat-Hisham are related to Mekka through orientation: the error is less than 8° west. In addition, it appears from this list that the error is rather decreasing and always clockwise: from al-Walid I to Hisham, Mekka was not very well situated, about 4° west of its true position.
- Third, the layouts of Khirbet el-Minya and Khirbet el-Mafjar, located in the

Table 3: The orientation of the first wall laid out throughout Umayyad buildings (F. Morin).

Qaṣṭal	south wall <i>qibla</i>	line running 7° north of Jerusalem; line running 5° north of Jerusalem; or perpendicular 31°W & 29°W of Mekka;
Qaṣr el-Kharana Jabal 'Usays	west or east wall east wall	line running 7° west of Mekka; line running 4° west of Mekka;
Khirbet el-Minya 'Ayn el-Jarr	south wall (<i>qibla</i>) south wall (<i>qibla</i>)	perpendicular 18° west of Mekka; or line running 14° south of Jerusalem perpendicular 4° west of Jerusalem or perpendicular 28° west of Mekka;
Q. el-Ḥ. el-Gharbi Q. el-Ḥ. esh-Sharqi Ruṣafat-Hisham	east wall east wall east wall	line running 6° west of Mekka; line running 1° west of Mekka; line running 4° west of Mekka;
Khirbet el-Mafjar	east wall south wall (<i>qibla</i>)	line running 19° west of Mekka; perpendicular 19° west of Mekka;
Mushatta	south wall (<i>qibla</i>) or perpendicular 40° west of Mekka;	line running 12° north of Jerusalem
Qaṣr eṭ-Ṭuba	south wall (<i>qibla</i> ?) north wall	unknown line running 13° south of Jerusalem or perpendicular 34° west of Mekka.

Jordan Valley and very close to Jerusalem, do not allow any reliable conclusion as to their orientation: both are related to Mekka with the same important error, about 18°, also clockwise.

— Fourth, Qaṣṭal and 'Ayn el-Jarr are, according to the evidence, related to Jerusalem instead of to Mekka, according to the 31° and 29° of error measured at Qaṣṭal. If we consider that the orientation was done in relation to Jerusalem instead of to Mekka, then the value of the errors decreases to 7° and 5° north (i.e. clockwise), just over the average error measured at the other Umayyad palaces (4° west, also clockwise).

At Qaṣṭal another fact must be taken into consideration. Muslim graves usually present a main axis (corresponding to the body) set out on a line perpendicular to the direction of Mekka. The face is turned to the right in the direction of Mekka. At Qaṣṭal, from the 28 graves uncovered at

the Umayyad cemetery in September 1985, the main axes of ten were laid on a line running directly through Jerusalem, without any error (0°). Inscriptions were found at six of these ten graves: Nos. 4, 5, 6, 7, 10 and 11. Some of these inscriptions seem to belong to the earliest group of Umayyad writing.

In the same cemetery, six other graves are related to Mekka, their main axes are exactly perpendicular to the direction of Mekka, and the face of each Muslim can be turned in this direction. Three of these graves bear inscriptions (Nos. 1, 2, 3), and the two first bear early Abbasid dates (228H. and 239H.). The eleven other graves are perpendicular to the south, some of them with inscriptions, including Nos. 8, 9 and 14 which may be dated from the late Umayyad or early Abbasid period.

At Qaṣṭal, there are different ways of setting out graves under the Umayyads and the Abbasids, and it seems possible to establish a chronological *hypothesis*:

Jerusalem may be earlier, at Qaṣṭal, than graves whose orientations are related to Mekka.

In conclusion, we must point out the fact that the layout of the palace and the mosque at Qaṣṭal as well as some graves from the Umayyad cemetery are related to Jerusalem instead of to Mekka.

Some other features must be noted about the palace and the mosque at Qaṣṭal, if they are compared to other Umayyad buildings, especially those usually attributed to the reign of al-Walid I (705-715) (Qaṣr el-Kharana, Jabal 'Usays, Khirbet el-Minya and 'Ayn el-Jarr):

- a) The *miḥrab* of the mosques at Jabal 'Usays, Khirbet el-Minya and 'Ayn el-Jarr is a concave niche. The rectangular recess uncovered at the mosque at Qaṣṭal seems to be earlier than the other three, and we do not know of any other rectangular *miḥrab* built under the Umayyads.
- b) As described by Brünnow and Domaszewski¹⁷, and as we have been able to restore them¹⁸, the six apartments of the palace at Qaṣṭal are identical (the eastern one is smaller because of the Entrance Hall). At Khirbet el-Minya and 'Ayn el-Jarr, the apartments are quite different and vary significantly, and the organization at Jabal 'Usays is far better than at Qaṣṭal: at Jabal 'Usays, 23 doors open onto the courtyard, instead of 13 at Qaṣṭal. The rigid arrangement at Qaṣṭal seems to be earlier than the others.
- c) The Audience Hall of the palace at Khirbet el-Minya is a basilica, and Audience Halls at 'Ayn el-Jarr and Jabal 'Usays have a simple apse opening onto a basilica. As far as other Umayyad palaces are concerned, everywhere that an Audience Hall has been recognized (Mushatta, 'Amman), or restored (Khirbet el-Mafjar), a basilica was found. Only two palaces differ: Qaṣr el-Kharana and Qaṣṭal. At Qaṣr

restored at the supposed Throne Room above the entrance¹⁹, and the Audience Hall is not a basilica (the building is not large enough). At Qaṣṭal, as we were able to restore it according to the remains and the carved blocks uncovered, the Audience Hall was a trichonos with an anteroom. By comparing Audience Halls during the Umayyad period, it appears that both Qaṣr el-Kharana and Qaṣṭal are earlier than all the others. At Qaṣṭal, the lavish carved stone decoration (and not stucco as at Khirbet el-Mafjar) leads to the same conclusion. In addition, if we admit that the Khalif or Governor held court in the central apse at Qaṣṭal, then we must note that he was turned in the direction of Jerusalem.

- d) Around the courtyard, the four galleries are decorated with mosaic floors, about 430 square meters. There is no other example of such richness in other Umayyad palaces, and this would place Qaṣṭal at the head of the list.
- e) The palace was finished, as the presence of glass-mosaic cubes and the crenelation using merlons indicate. If we admit that the palace (over 19,000 cubic meters of ashlar, i.e. 22,000 m³ of masonry), the mosque and the dam (over 5,000 cubic meters of ashlar, i.e. 21,000 m³ of masonry) were built together, as the similitude of building techniques indicate, we must consider that the construction of the whole required at least ten years, however many labourers were employed. Thus the reign of al-Walid I (705-715) may have been a little too short.
- f) Qaṣṭal was cited by the Umayyad poet Kuthayyir 'Azza when he was at el-Muwaqqar at the court of Yazid II (719-724)²⁰: the way he turned his compliment shows that Qaṣṭal was well-known and already completed at that time, and that the owner may have been proud of it. This would be enough to

17. Brünnow & Domaszewski: *op. cit.*

18. Carlier & Morin: *op. cit.*, p. 370 and 381.

19. Jaussen & Savignac: *Les châteaux arabes de*

Qusayr Amra, Haraneh et Tuba, mission archéologique en Arabie III, Paris, 1922.

20. Carlier & Morin: *op. cit.*, p. 349-350.

forbid a Hisham dating (724-743) of Qasṭal, and raises a problem: Yazid II cannot be, according to the evidence, the builder of Qasṭal. Could he have been proud of a palace built by his brother Walid I? If so, why did he build el-Muwaqqar? If not, why did Kuthayyir 'Azza turn his compliment that way?

g) Concerning the Umayyad cemetery mentioned above, it must be noted that here is the first known example in the Middle East of a cemetery associated with an Umayyad palace. Maybe other Umayyad cemeteries have not been uncovered yet, or they have been destroyed. It seems that burial habits changed at Qasṭal during the Umayyad period, some graves characterized by the orientation on a line running through Jerusalem and some others by the usual orientation perpendicular to Mekka.

If we study the variation of orientation errors at Qasṭal, we must note that first the palace would have been laid out (7° of error), then the mosque (5° of error), and finally some graves, for no error was made at some of the latter. Their more accurate orientation indicates that some years separate the laying out of the palace and some of the graves, enough to improve orientation but not too much to change burial habits²¹. If such an orientation is not to be recorded during the ten-year long reign of al-Walid I, the hypothesis of a 'Abd el-Malik dating (685-705) of some of the graves at Qasṭal *may not be absurd*.

Finally, al-Walid I is famous because he ordered the restoration of the Mosque of the Prophet at Medina, and we cannot see why he would have turned towards Jerusalem. On the contrary, 'Abd el-Malik tried to develop a new pilgrimage center at Jerusalem, ordering the construction of the Dome of the Rock. Therefore, relationships which were established between Qasṭal and the Dome of the Rock may be

interpreted as favouring a 'Abd el-Malik dating of Qasṭal.

The *hypothesis of a 'Abd el-Malik dating* would explain:

- 1: the use of the same value of the Umayyad Cubit: 0.5420m at the Dome of the Rock and at Qasṭal;
- 2: the use of the same erroneous value of the $\sqrt{2}$ ratio: 1.3938053... on which are based both laying out procedures;
- 3: the orientation of the first wall set at the palace;
- 4: the orientation of the *qibla* of the mosque;
- 5: the rectangular recess at the mosque;
- 6: the orientation of some graves;
- 7: the improved orientation of graves ('Abd al-Malik's reign was long enough);
- 8: the changing burial habits observed at Qasṭal (related to late Umayyad and early Abbasid inscriptions);
- 9: the rigid arrangement of apartments;
- 10: the organization of the Audience Hall;
- 11: the enormous quantity (some 25,000 cubic meters of ashlar) and the high quality of stone work, unknown in other Umayyad buildings, which was often the sole argument for a Roman dating of Qasṭal;
- 12: the incredible richness of the decoration (mosaic, glass mosaic and carved stone), not matched at other Umayyad palaces;
- 13: the completed construction of the palace;
- 14: that mosaic and carved stone patterns seem to belong to the earliest Umayyad art, related to the Dome of the Rock;
- 15: the way Kuthayyir 'Azza turned his compliment to Yazid II: the latter may have been proud to own Qas-

21. One of the graves, located D-E/7, immediately north of grave QA 13, (see Fig. 14) may be one of the oldest: its main axis is laid on a line

running a few degrees north of Jerusalem, as recorded at the mosque and at the palace.

We have not been able to provide any *proof* of the 'Abd el-Malik dating of Qasṭal, and until it has been done, SUCH DATING IS ONLY HYPOTHETICAL. But in the present state of affairs, we believe it crucial to draw attention to the major importance of Qasṭal.

We feel convinced that Qasṭal (the palace and the mosque at least) was laid out, built and completed under the reign of 'Abd al-Malik (685-705). This would make the palace the oldest farming civil complex in Islam still in place, and the mosque at Qasṭal (with its minaret) the oldest still

Finally, Mr. Eric Ordener, one of the students of architecture of the 1985 mission, chose the development of Qasṭal as the subject of his thesis. This research, starting with the idea of a Museum of Umayyad Art beside the Queen Alia International Airport, is being carried out with the help of Frédéric Morin who also proposed to the Department of Antiquities a restoration project for the Umayyad remains at Qasṭal.

Patricia Carlier
Frédéric Morin