

# THE BROWN UNIVERSITY 1998 EXCAVATIONS AT THE PETRA GREAT TEMPLE <sup>1</sup>

by

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## Introduction <sup>2</sup>

With the continuing support of the Department of Antiquities of the Hashemite Kingdom of Jordan and Dr Ghazi Bisheh, then, Director-General, the sixth season of excavations were carried out at the Petra Great Temple from June 9 to August 10, 1998. With the discovery of the Temple theatron in 1997,

we have explored questions about the function(s) of the Great Temple. For the past two years a number of possible explanations for this structure's function have been suggested, which test the hypotheses that the process of rebuilding involved successive changes in the use of this structure. These hypotheses are in print elsewhere.<sup>3</sup> This report will focus only

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1. Please refer to our Past Seasons Annual Reports (1993-1998) in *ADAJ*. The standard for archaeological publication is a full record of the work undertaken. The following publication has been prepared with a CD-ROM which includes all of our data collected. See M. S. Joukowsky (1999) *Petra Great Temple, Vol. I — Brown University Excavations 1993-1997*, The Petra Exploration Fund, Brown University.

2. The 1998 staff was comprised of Martha S. Joukowsky, Director; Artemis A. W. Joukowsky, Administrator and Photographer; Dr. Joseph J. Basile, Associate Director; Paul C. Zimmerman, Chief Architect-Surveyor; Deirdre G. Barrett, Finds Recording; Monica L. Sylvester, Computer Database; Simon M. Sullivan, Draftsperson; Eileen L. Vote, Photogrammetric Study; and Sara G. Karz, Glass Analyst and Archaeologist. Senior Archaeologists included Leigh-Ann Bedal; Laurel D. Bestock, Brian A. Brown, Katrina M. Haile, Elizabeth A. Najjar and the field excavators were Samuel J. Ginsberg, Joshua J. Schwartz, James M. Roger, Emma S. Libonati, and Mary E. Prendergast. Volunteers included Betsy F. Alderman, David Barrett, Francesca Bennett, Seth Bright, Michael Cary and Will Cary, Donna D'Agostino, Elliot Jerud, Nina, Murat and Sureya Koprulu and Jane, Misha and Elena Maria Joukowsky, Arnold Schaab, Forest Reed, Jane Taylor, and Robert Zeolla. We were also honored to receive the visits of Her Majesty, Queen Noor Al-Hussein of Jordan, HRH prince Faisal Al-Hussein, and E. Gordon Gee, President of Brown University and his wife, Professor Constance Baumgarner Gee.

Besides Stephen V. Tracy, epigraphist, and Donna D'Agostino our computer systems analyst, 1998 Great Temple Consultants included architectural historians Judith S. McKenzie, Jacqueline Dentzer-Feydy and Chrysanthos Kanellopoulos; Thomas R. Paradise, geologist; Zbigniew T. Fiema, archaeologist and historian; May Shaer, con-

solidation and preservation; Christian Augé, numismatics; Stephan G. Schmid, Nabataean Fine Wares analysis; Yvonne Gerber, Nabataean Plain Wares analysis, and Rip Rapp, geologist. Our intrepid Foreman, again, was Dakhilallah Qublan who also has been responsible for the carrying out of the consolidation and conservation of the Great Temple. For help in moving architectural components and soil removal the Jordanian Department of Antiquities assigned Abu Ghandi to us — his service was indispensable. Once again, the Jordanian Department of Antiquities appointed Mohammad Abd Al-Aziz Al-Marahahleh as our Jordanian Government, Department of Antiquities Representative.

The Brown University Petra Great Temple Excavations are deeply grateful to the Replogle Foundation for the generous grant, which helped to underwrite the costs of excavation. A number of private donors helped to sponsor student involvement and Brown University underwrote graduate student participation. Two undergraduates, Emma S. Libonati and Samuel J. Ginsberg, received Brown University Undergraduate Teaching and Research Awards (UTRA grants) which made their participation possible. To help us with consolidation and restoration, we were recipients of a grant administered through the Kress Foundation, and the American Express Company, World Monuments Watch, A Program of the World Monuments Fund. The publication of our Five-Year Report and additional conservation efforts have been underwritten in part by the Halmos Family Foundation and other donors.

3. The preliminary results of this fascinating research is presented in Joukowsky 1999, "Petra: Brown University Excavations of the Great Temple: Questions About Functional Analysis", Seventh International Congress on the History and Archaeology of Jordan, "Jordan by the Millennia," in *SHAJ* VII (in press), and Schluntz 1999.

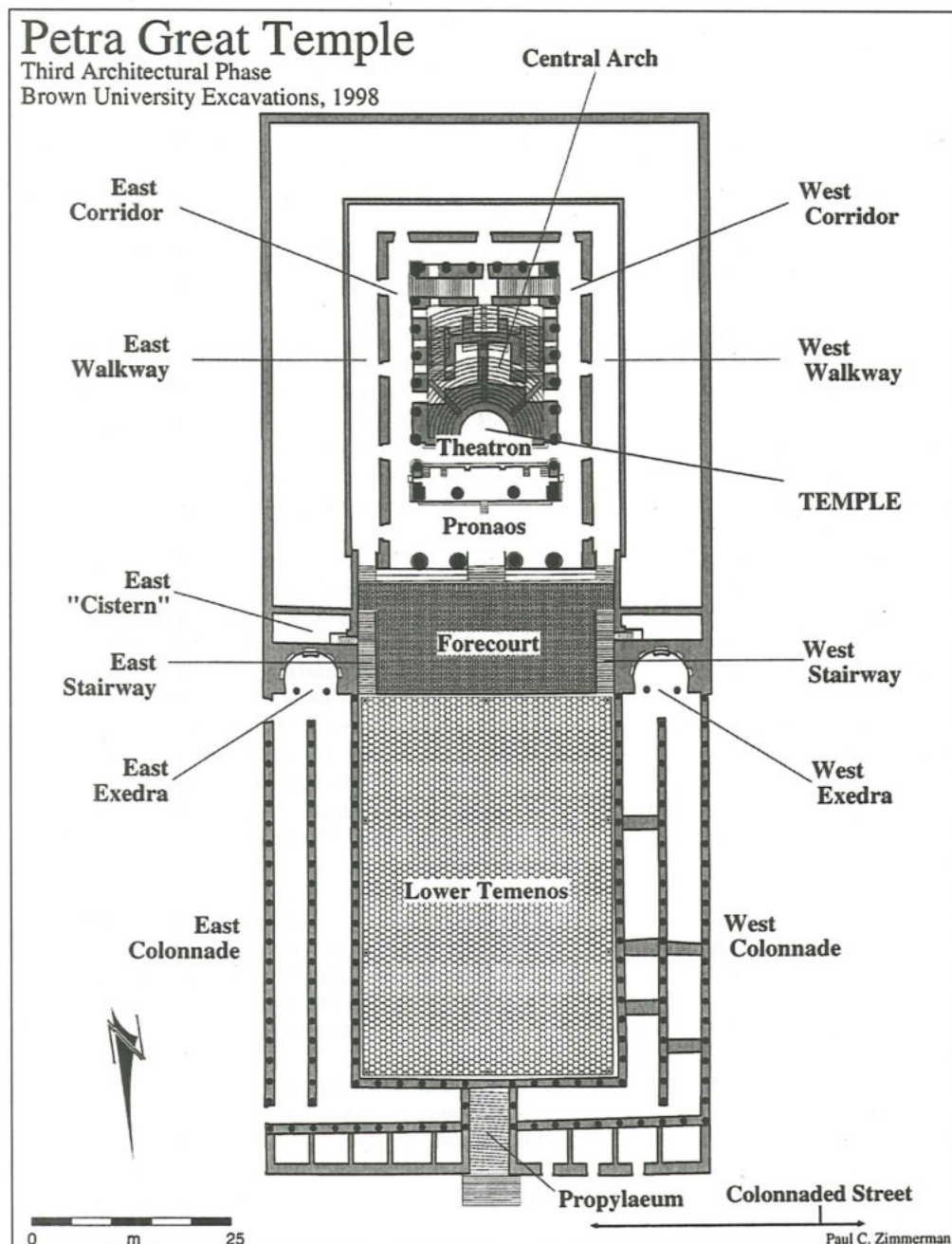
on the results of the current excavations. The 1998 plan of the excavations can be seen in Fig. 1, the 1998 trench layout in Fig. 2, and a site aerial photograph is presented in Fig. 3.

### Objectives

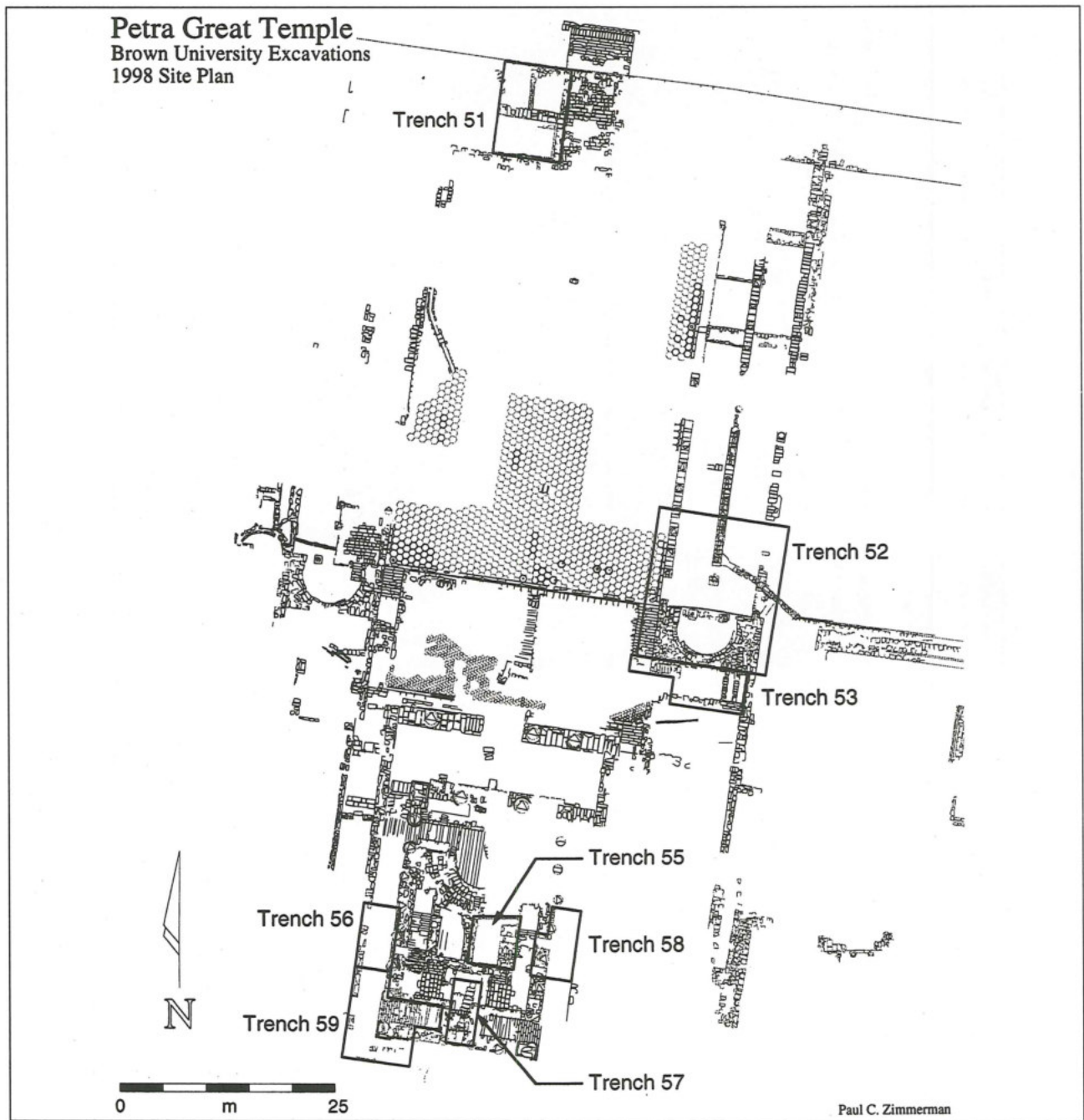
The Great Temple 1998 excavation objectives included further exploration of the Propylaeum, a north-south 11 m-by-8 m east-west trench in Trench 51 by K. Haile.

In the Lower Temenos, the partially excavated East Exedra had been consolidated during the fall of 1997, and we wished to complete its excavation, and to better understand its interrelationship with the East Colonnade. A large trench, Trench 52, 15.3 m-by-18 m was measured out. With a full season of work under the direction of J.J. Basile, the area was completely excavated.

In the Upper Temenos we wanted to continue our work in the area of the 'cistern'-lo-



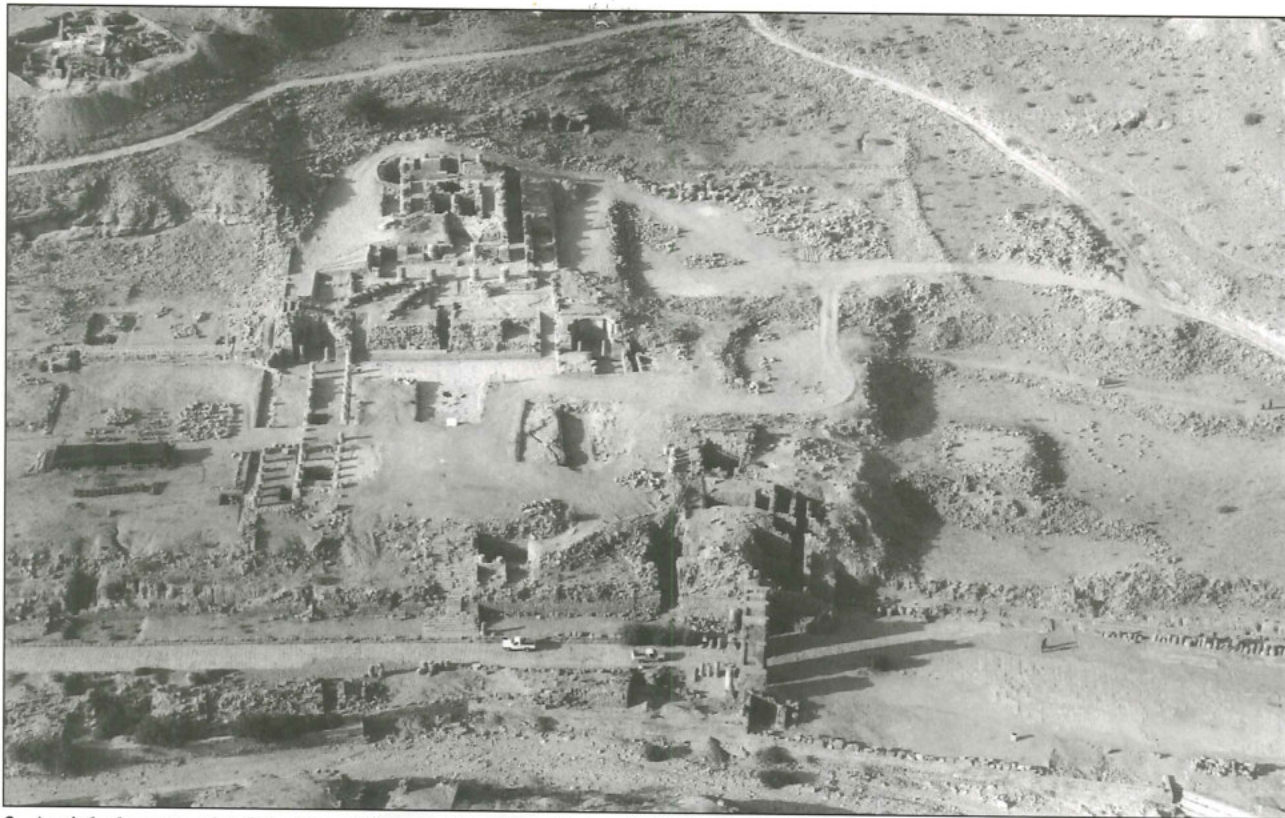
1. Plan of the 1998 Brown University Great Temple Excavations (Paul C. Zimmerman).



2. Site Plan of the 1998 Trenches (Paul C. Zimmerman).

cated just behind the East Exedra to determine its floor level and to explore if it truly served as a cistern. Here it was projected that we would excavate two trenches, Trench 53 and Trench 54 which were the continuation of the 1997 excavations in this area. However, the excavation of Trench 53 by L. D. Bestock was so time-consuming due to the depth of deposit that there was no time to excavate Trench 54.

The excavation strategy for the temple was complex. Of course we wanted to reveal the eastern half of the *theatron* discovered in 1997, but due to the overburden of earth and collapse, this could not be undertaken until both the East Chamber and the Central Arch had been completely excavated. A trench, Trench 55, which was parallel to both the West Stairs and the West Chamber in the temple rear was excavated



3. Aerial photograph of the Great Temple Precinct (Artemis A. A. W. Joukowsky).

by B. Brown, but work here will have to be completed in 1999 before we can continue our excavation of the *theatron*. Because it required consolidation before it was safe enough for excavation, work below the Central Arch had eluded us for four years. Trench 57 was devoted to the Central Arch deposit, which was completely revealed by E. Libonati and M. Prendergast. An additional objective was to work on the Temple west to clear the West Corridor, and if possible to discover if it stopped short or continued beyond the rear of the Temple. For our understanding of the architecture, Trenches 56 and 59 directed by A. A. W. Joukowsky accomplished this objective.

On the Temple East we had been confronted with a massive column fall in the East Corridor, which we cleared in Trench 58 supervised by J. Schwartz. The objective of recording the column fall and moving column drums to the east of the Upper Temenos served as the prelude to their anastylosis. Furthermore, excavation would help

to define this East Corridor.

We also wanted to explore the area beyond the Temple Precinct lying to the Temple east, traditionally known as the 'Lower Market.' This large area was designed to be a one-year survey with limited excavation to be undertaken by Leigh-Ann Bedal. Several interdependent projects were also undertaken, such as the plan to create a computer simulation using photogrammetry and virtual reality by E. L. Vote. Fortunately all of our data collection systems continued to be useful.

The 1998 field season produced more unexpected results. Before turning to examine these results which go far in explaining the nature of the short-lived Nabataean architectural and artistic tradition, we will pause to present elevations and distance measurements and the phasing of the Temple Precinct. As part of the excavation record and for the clarification of our Electronic Distance Measuring (EDM) results, I present the absolute elevations resulting from our

past six seasons at the Great Temple. We all know that archaeology is scientific opinion, not proven fact, however, we offer the elevations and dimensions of the Great Temple precinct, which are part of our factual record.

### **Elevations of Major Temple Precinct Components in Meters asl**

#### *Site Datum Points*

Al-Katūta — 911.23  
 CP 103 — 895.48  
 CP 104 — 884.34  
 CP 10 — 878.73

#### *Colonnaded Street*

Crown directly north of Propylaeum — 870.77  
 South gutter directly north of Propylaeum — 870.59

#### *Propylaeum*

Curbing — 871.10, Lowest Step — 871.19, Upper step — 877.69

#### *Lower Temenos*

Hexagonal Pavement —  $879.12 \pm 0.12$ , Easternmost Colonnade —  $879.07 \pm 0.16$  (pavers and stylobate slope downward slightly), Sondage SP 25 depth — 872.41  
 West Exedra Height (maximum) — 883.96, Porch column Stylobate — 879.79, Byzantine Platform — 880.69  
 West Stairway Lowest step-curb — 879.58, Restored upper step — 884.38  
 East Exedra maximum height — 885.60, Porch column Stylobate — 879.59  
 East Stairway: Lowest step-curb — 879.58, Last excavated upper step — 883.02

#### *Upper Temenos*

West Corridor —  $885.91 \pm 0.06$ , West Corridor maximum height — 889.46  
 East Corridor —  $885.87 \pm 0.03$ , East Corridor maximum height — 890.51  
 Temple Forecourt —  $884.46 \pm 0.04$   
 East Archway "Cistern" Arch upper eleva-

tion — 885.67, Lowest excavated elevation (quarry) — 879.20, Lowest plaster floor — 881.06

#### *Canalization System*

Temple Forecourt, capstone upper elevation — 884.29, Floor elevation — 882.04, Trench 13 lowest elevation below Hexagonal Pavement — 878.68 (approximate)

#### *Temple*

Stylobate —  $886.07 \pm 0.05$ , Pronaos —  $885.79 \pm 0.04$ , Preserved height of West Anta — 2.6, Preserved height in south — 8.5, Restored Porch columns average —  $888.40 \pm 0.10$ , West Anta elevation — 889.59, East Anta elevation — 888.19, West Walkway —  $885.98 \pm 0.01$

#### *Theatron*

Orchestra —  $885.97 \pm 0.02$ , Lowest diazoma —  $887.55 \pm 0.02$ , Lowest seating —  $887.94 \pm 0.01$ , Uppermost excavated seating — 889.03, Projected last seat (approximate) — 895.11, Lowest step — 886.415, Restored uppermost step — 890.93, Upper platform — 890.93.

#### *Southeast N-S Stairway*

Floor at the bottom of stairs — 886.05, Lowest step — 886.42, Restored uppermost step — 890.96, Upper Platform — 890.97

#### *Southwest N-S Stairway*

Floor at bottom of stairs — 886.07, Lowest step — 886.415, Restored uppermost step — 890.93, Upper platform — 890.93

#### *Central Arch*

Top of keystone — 890.95  
 Heart-shaped east rear column restored height — 892.93

### **Great Temple Precinct — Dimensions in meters**

*Precinct north-south* (from portico wall in the Propylaeum to the preserved south Pre-

cinct wall) — 135; east-west — 56, Total area — 7560 m<sup>2</sup> (3/4 hectare)

### *Propylaeum*

Stair width — 7.4; length — 17

### *Lower Temenos*

N-S (from the Propylaeum Retaining Wall to the Lower Temenos Retaining Wall) — 49

East-west — 56, Retaining Wall West — 28, Expanse of Lower Temenos from the East Exedra to the West Exedra — 32.7

*East Colonnade:* Width — 11.8; Length from the Exedrae to Propylaeum Terrace Wall — 54

*East Exedra:* east-west — 6.8; depth north-south 5.4

*West Exedra:* east-west — 6.5; depth north-south — 5.3

### *Temple*

Porch Stylobate east-west — 28, Temple north-south — 42.5, Porch inter-axial distance between the East Anta (middle line of the wall) and the East Porch Column — 4.40, East Porch Columns — 5.03, Central Porch Columns — 7.06, West Porch Columns — 5.03

### *Pronaos*

Width (from the Stylobate south edge to the front of the Anta East and Anta West — 6.5, Length — 24.7, Side Columns inter-axial distance east and west — 3.51, Rear columns inter-axial distance — 3.27

### *Theatron*

Orchestra floor diameter — 6.43, Proposed diameter of outermost seats — 33.2, Estimated seating capacity (0.5 m per person) — 565; (0.45 m per person) — 620

*West Corridor:* length from the front of

West Anta to the rear — 12, Width — 3

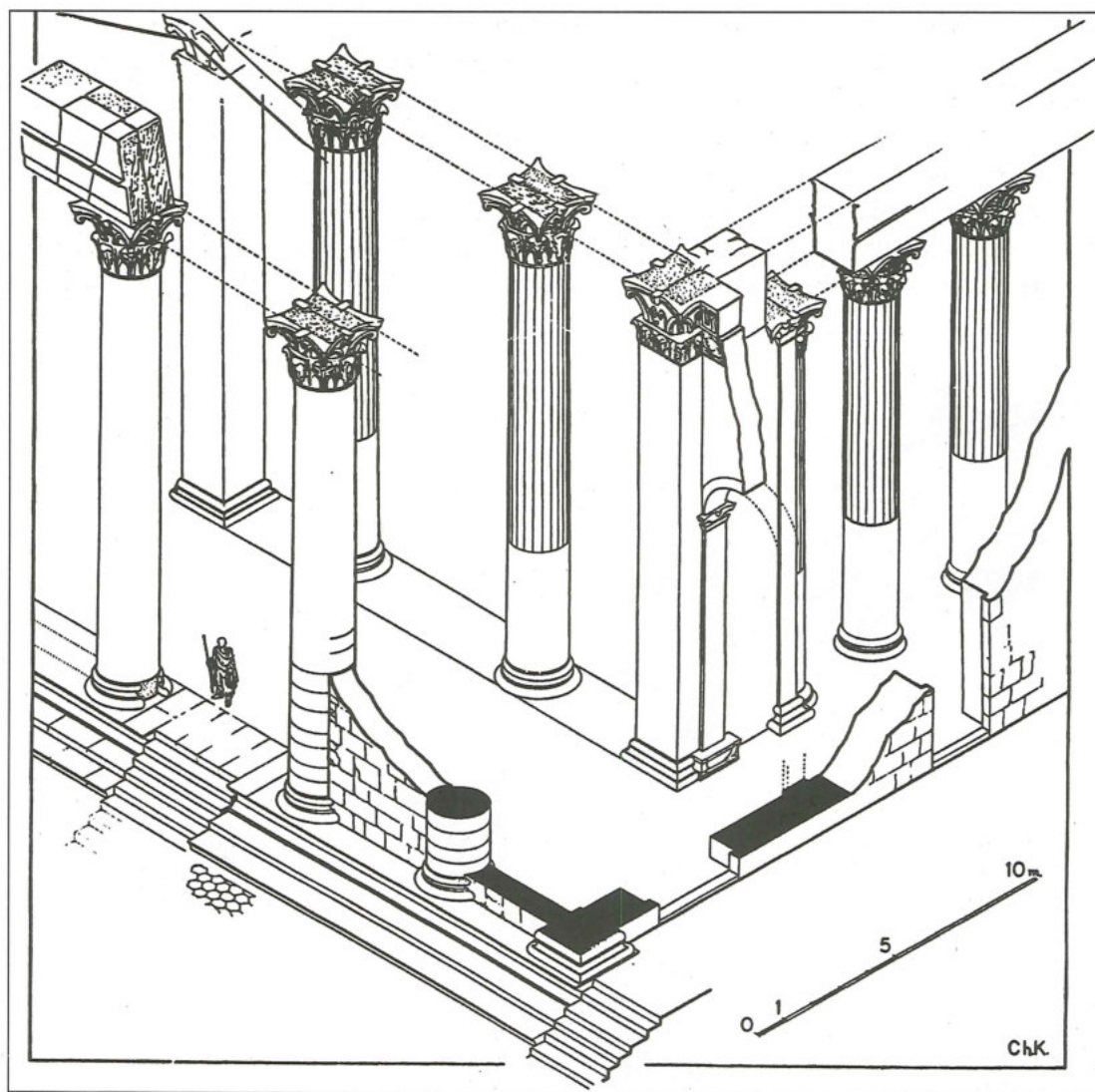
West Walkway: Excavated length from the front of the West Anta — 33.3, width — 3.7

### *Phasing*

Since 1993, we have revised our phasing of the site and the 1998 season was no exception. Based on the 1988 site deposition, our excavations have determined the general sequence of four phases (0-III) of Great Temple construction. *Phase 0* is reserved for the preparation of the site by its Nabataean builders with a vast subterranean canalization system which has been charted from the Temple rear to the Propylaeum.

*Phase I* or Nabataean I represents the major construction of the Temple precinct. The major goal was to construct a building of importance in central Petra and to orient it toward the main thoroughfare of the city. Figure 4 is a reconstruction of this phase proposed by architectural historian, Chrysanthos Kanellopoulos. The dramatic rocky backdrop of al-Katūta provided a perfect setting for an imposing structure set on a high terrace platform. Phase I included the erection of the four porch and the two Pronaos columns, plus the eight interior bichrome plastered columns on the building's flanks and six columns at the rear. Decorated with deeply carved fine sculpted limestone Nabataean Corinthian capitals, their column shafts were embellished with flat, red or yellow plaster at 3.76 m from their attic bases, and above, with white ridged plaster until the beginning of the capital. Also decorated with multi-colored plaster, corridors were also constructed to flank the structure. The evidence suggests these elements and lateral corridors were constructed sometime in the last quarter of the first century BCE or during the reigns of either King Malichus I (62-30 BCE) or Obodas II (30-9 BCE), or perhaps both.

*Phase II* is what we refer to as Nabataean II. There was a completely new, monumental rebuilding program — an archi-



4. Phase I Great Temple Reconstruction (Chrysanthos Kanellopoulos).

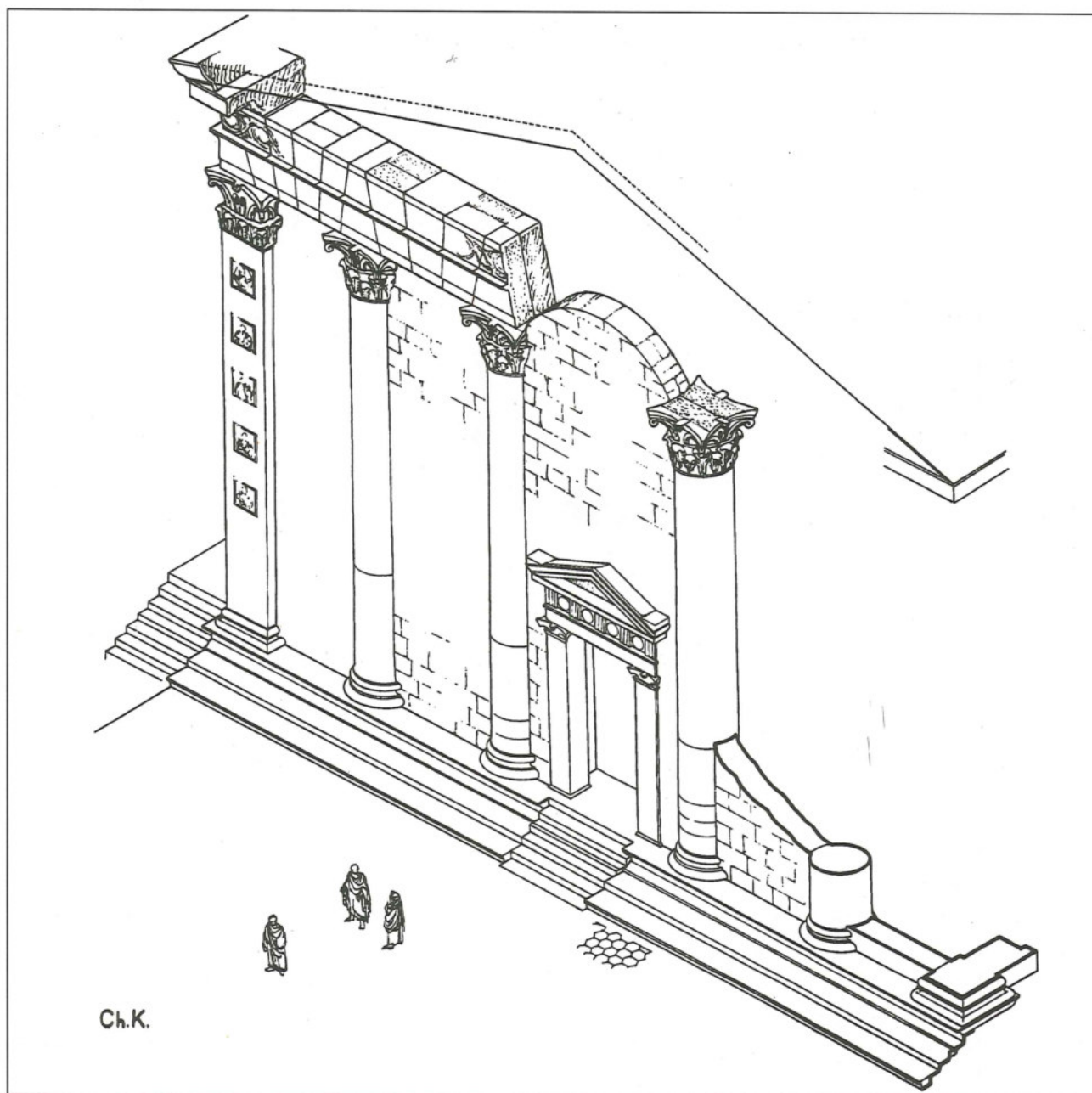
tectural metamorphosis was launched in this phase. The architects wanted to make a strong statement and epitomize the architecture of a great city. It is obvious that the rulers of Petra took pride in the embellishment of their precinct while providing for its functional demands with a sense of spatial logic. The precinct had to emanate a sense of power befitting Nabataean wealth. So, what did these Phase II architects have in mind? To begin with, there had to be the building of an elegant, columnar Propylaeum for access to the precinct, and a series of new steps had to be laid to be built up to the level of the Lower Temenos. At the same time the Lower Temenos was conceptualized as a symmetrical, formal pres-

ence that purposefully emphasized the Great Temple.

There was, however, a challenging and exasperating problem confronting the planning of the area — the Canalization System had to be reconfigured and rebuilt. This set in motion a completely new series of changes that radically transformed the design of the Lower Temenos — for how were people to access the Upper Temenos from the Lower Temenos? This may have provided the impetus for a scheme that would involve the precise planning for the complete remodeling of the Lower Temenos, approaching all aspects of the Lower Temenos design simultaneously — from the laying out of stairways and exedrae to enhancing

the area with triple colonnades. In short, the area was converted to create a vast architectural foreground for the Great Temple.<sup>4</sup> A massive east-west retaining wall had to be built on the same axis as the twin lateral stairways and the exedrae, which delimited the Lower Temenos on its south. This Lower Temenos court-plaza was then em-

bellished with a sweeping, white, limestone hexagonal pavement, which tied all the elements together. These architectural components were all interconnected features that boldly defined the precinct's spacious importance. For Phase II we have two reconstruction schemes suggested by Chrysanthos Kanellopoulos. Figure 5 shows one



5. Phase II Great Temple Reconstruction (Chrysanthos Kanellopoulos).

4. These lateral staircases had to have accompanying luxurious exedrae and other appurtenances to com-

plete the finished look of the ensemble.

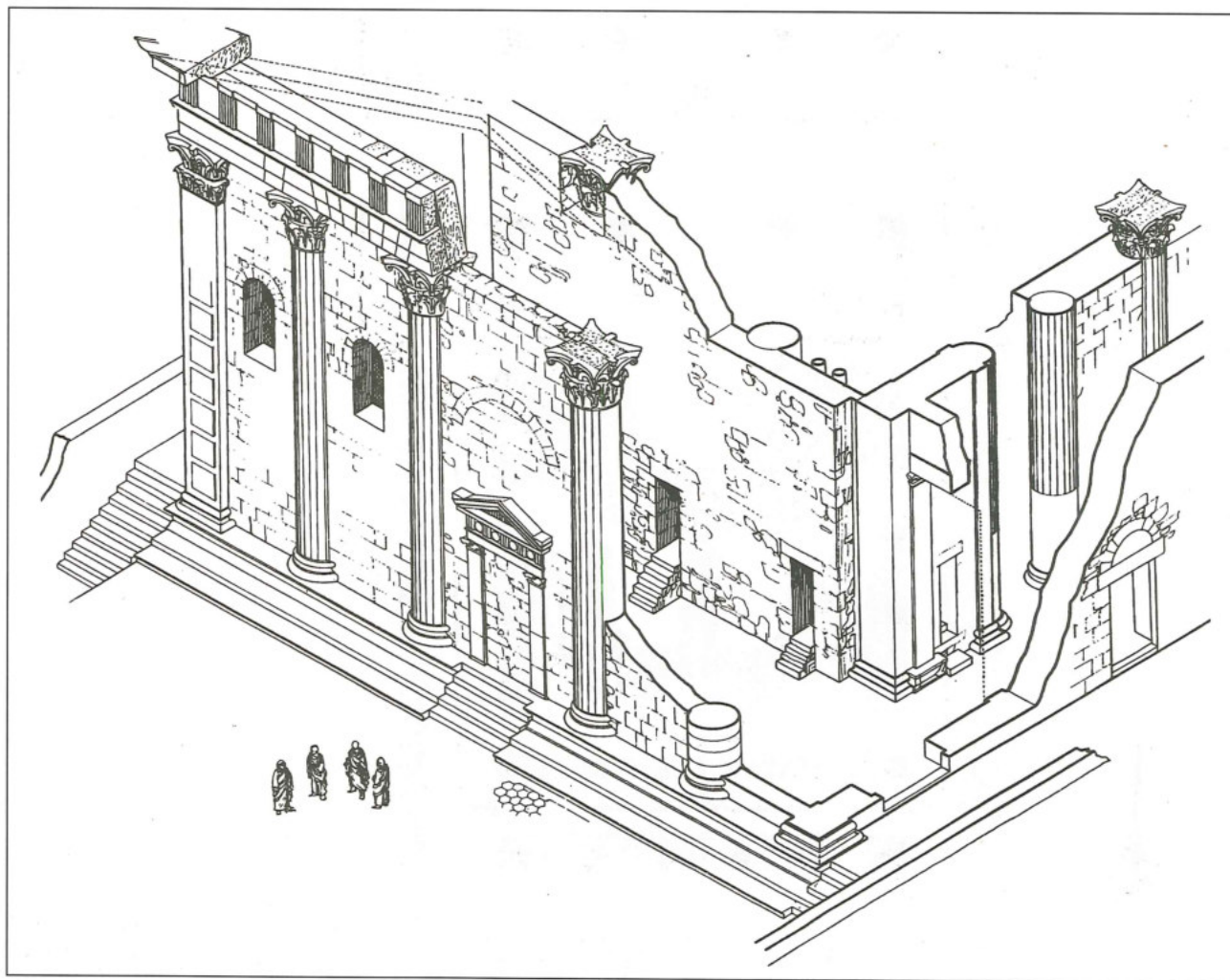


such scenario and Fig. 6 depicts an alternate stage where the porch was completely blocked-off.

The Phase II Temple continued to crown the composition of space, and the edifice we know today as the Great Temple emerged. Its transformation must have reflected the changed circumstances of Petra royalty. The exterior was enlarged with exterior walkways on its flanks. Also at this time, there was the major reconfiguration of the Temple interior with the elegant construction of Inter-Columnar walls with arched doorways, windows and staircases. The building of these casemate walls all but destroyed the plaster decoration of the Phase I stuccoed columns.

In Phase II the Phase I central room is re-

constructed as an open-air *theatron*. The heart of the Great Temple is now the theater, and the architects blended the proportions of the cavea seating to conform with the Phase I architecture. The projected preserved diameter of the orchestra is approximately 6.5m — it is too restricted and small for any large function, but may have been used for speeches, dramatic presentations, or simple religious rituals and ceremonies. Unfortunately the upper portions of the *theatron* are either in poor condition or are completely missing, but we project there may have been 20 original courses of seats, with a diazoma between the tenth and the eleventh rows. Thus, a conservative estimate of the seating capacity would be a minimum of 565 and a maximum of 620 persons. These

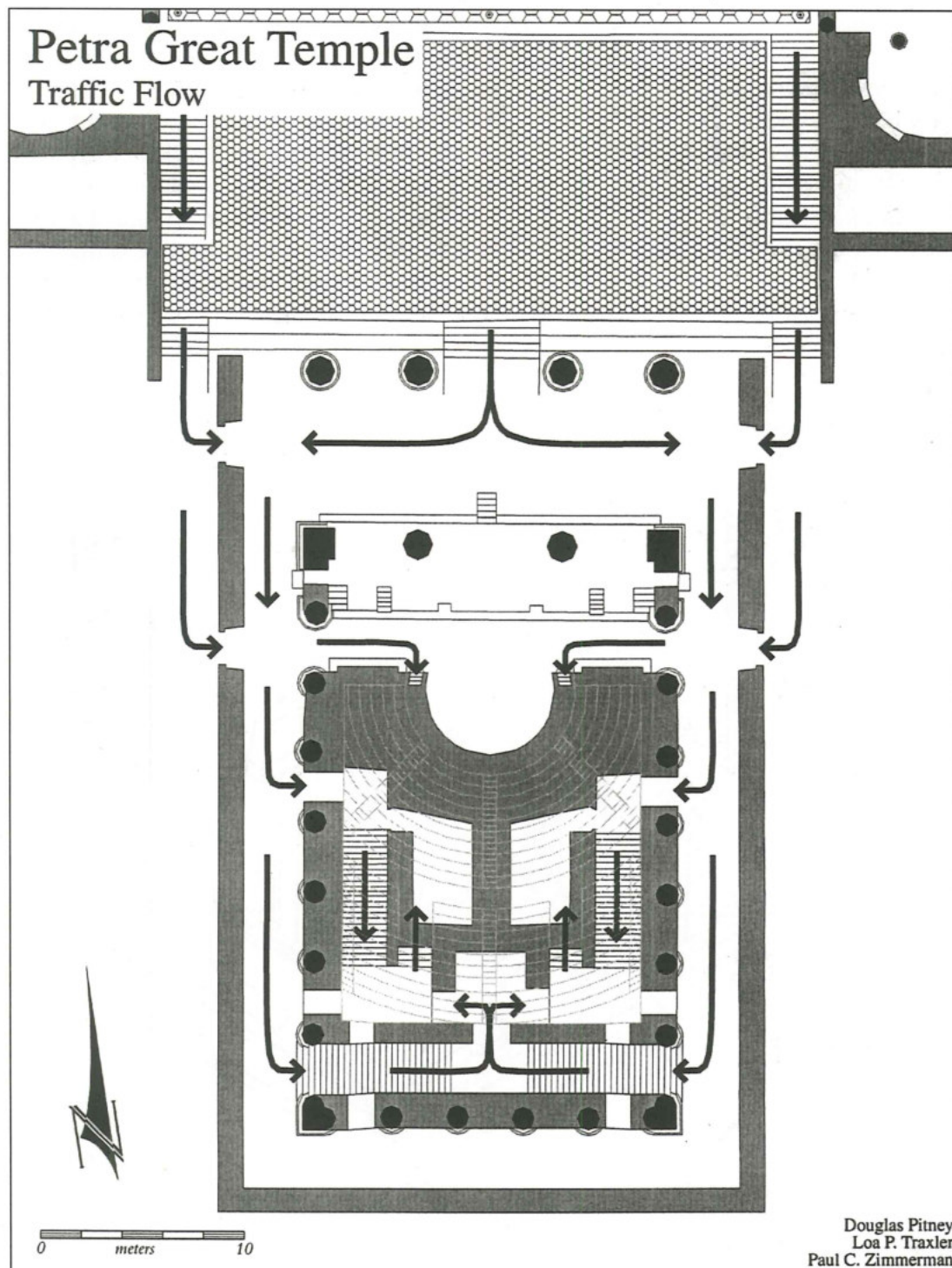


6. Phase II Great Temple Alternate Reconstruction (Chrysanthos Kanellopoulos).

calculations must remain tentative, however, until we can confirm the extent of the cavea to the south.

Given the plan for this building, the flow pattern is extraordinarily well planned and efficient (Fig. 7). Access was from the Lower Temenos, up the east or west stair-

ways, to the east or west walkways and from the walkways into the east or west corridors. Multiple sets of new stairs were installed in the Temple rear — twin east and west, plus twin north and south stairways. These led to the lateral corridors and the East and West (north-south) stairways with



7. Great Temple Flow Pattern (Paul C. Zimmerman).

adjacent east and west vaulted chambers. These four stairways directed traffic to the inner corridors, which in turn led to the Temple exits — the walkways.

Alternatively, access might also have been through the front entrance. The participant was obliged either to turn to the right or left into the corridors, and the major route would be from the corridors through the arched doorways to a set of stairways. Once these rear stairs had been mounted, access to the cavea was via the paved platforms, which accessed an additional twin small flights of steps that probably led to arched passages which exited into the cavea at the middle diazoma.

This renovation we have placed sometime near the end of the reign of Aretas IV (ca. 40/44 CE) or to the rule of Malichus II (40/44-70 CE) and possibly to the reign of Rabbel II (70-106 CE). It is therefore suggested that these modifications took place sometime in the first or early second centuries CE. But questions persist: What was the transition between the earlier Nabataean structure and what we know as the Great Temple? Why was the transition from one type of installation to another so swift, in less than 100 or so years?

The next phase, *Phase III*, we identify as Nabataean-Roman. Serving as a buffer state against the desert tribes, Nabataea retained its independence but paid taxes to Rome. Completely subsumed by the Romans under the Emperor Trajan in 106 CE, Petra and Nabataea then became part of the Roman province known as Arabia Petraea. Under Roman rule, Roman classical monuments abounded at Petra, many with Nabataean overtones; thus, it is appropriate to identify this time (post-106 CE) as the Nabataean-Roman phase. There is no reason why the Great Temple should not have continued to serve the Romans as a principal monument of the city.

When Petra entered into the "Roman" world in the second century CE, we assume

that Nabataean-Roman architects recycled the Great Temple, and this is our Phase III or Nabataean-Roman period. And if there were post-106 CE changes made to the Temple and its precinct, these changes are not altogether clear from the stratigraphy. We posit, however, that at some point during the Nabataean-Roman period — in the last half of the second century CE — the lower Stairs of the Propylaeum were modified to conform with the paving of the Colonnaded Street and were added to for ease of entry into the precinct.

As excavations continue, it must be borne in mind that this phasing is tentative and may be revised in light of future excavation. Our understanding of the site has been difficult, not because of the lack of dateable materials, but because the mixture within archaeological contexts of artifact stylistics ranges from the first century BCE to the early fifth century CE in date. Thus, we believe the Great Temple precinct was in use for approximately 500 years. There are few sealed deposits, and much more has yet to be explored before we can understand the archaeological deposition of these remains.

### 1998 Excavation Results

Following our usual pattern, the major excavated features of the 1998 season will be described from north-to-south beginning with the Propylaeum, the Lower Temenos, the Upper Temenos, and finally, the Temple.

#### *Propylaeum* (Fig. 8)

To the west of the Propylaea Steps, an arched walkway or corridor, which was constructed parallel to the Colonnaded Street, was excavated by K. Haile in Trench 51 to a 3.50 m depth. The layout of this trench can be found in Fig. 2. Between the upper and lower east-west retaining walls, this corridor was constructed earlier than the present day steps leading from the Colonnaded Street



8. 1998 Propylaeum  
(Artemis A. W.  
Joukowsky).

into the Temple precinct. The excavators noted that the Propylaea Steps wall was constructed with a number of voussoirs, and that the upper east-west retaining wall was an original terrace wall of the precinct. The lower retaining wall, however, was probably contemporary to the building of the steps and the Colonnaded Street. These observations will have to be confirmed by future excavation.

Large amounts of roof tiles suggest that this area was originally covered. Tesserae were found as well as decorative plaster and coins. Architectural fragments numbered 75, and of these six elephant sculptural elements were recovered, which suggests that the elephant capitals associated with the Lower Temenos triple colonnades may have been part of the Propylaeum architectural program.

#### *Lower Temenos*

Supervised by J. J. Basile, Trench 52 was a large trench devoted to the excavation of the East Exedra shown in Figs. 9 -11, and the Eastern Colonnade to the north. (The plan of the East Exedra is shown in Fig. 11.)



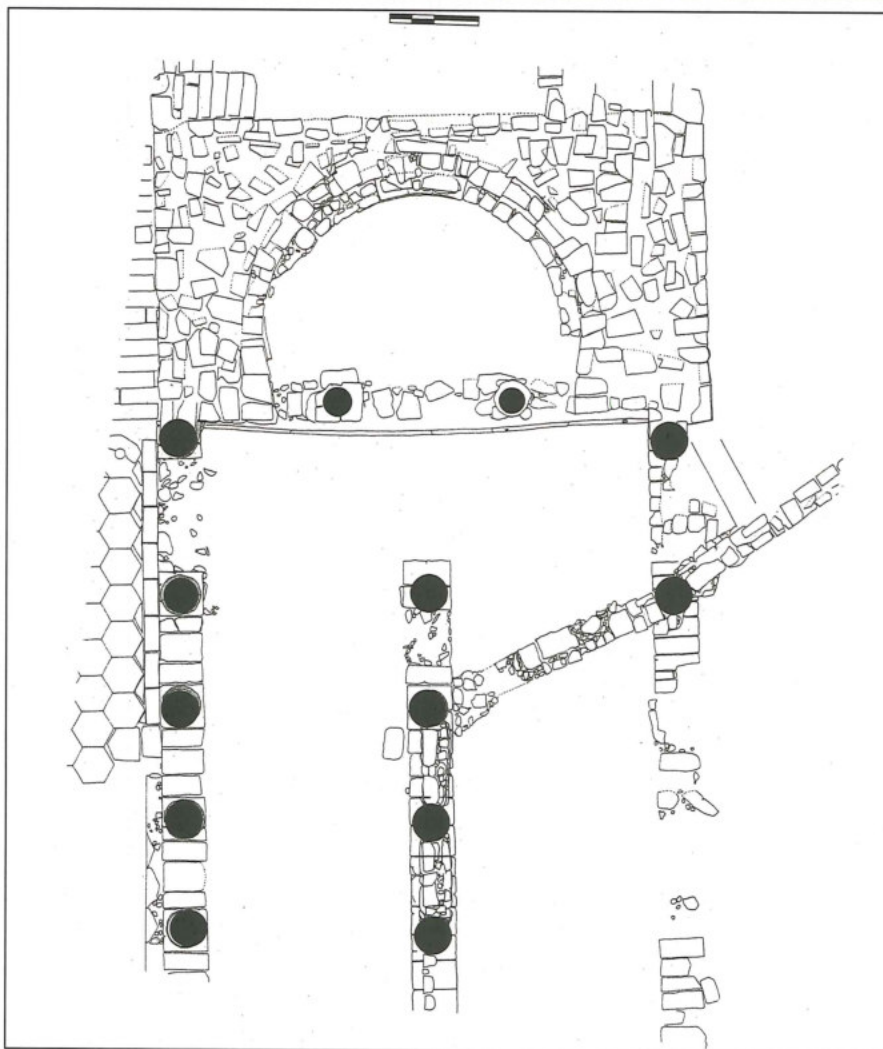
9. 1998 East Exedra during excavation showing the stratigraphy (Artemis A. W. Joukowsky).

Because the area extent of the trench was so large, it consumed the excavation season. Completely excavated, therefore, in the Lower Temenos was the elegantly-butressed *East Exedra*, which unlike its counterpart in the west (the *West Exedra*) was found to be appointed with interior benches and a central podium, which may have served for the placement of statuary. This semi-circular structure is preserved to a 5.8 m height, a 12.4 m exterior width, a 6.7m interior width, and a 5.4 m depth from the double entry columns to its rear wall.

The walls of the East Exedra are of fine



10. 1998 East Exedra completed excavation (Artemis A. W. Joukowsky).



11. 1998 East Exedra plan (Field drawing Paul C. Zimmerman and Joseph J. Basile, drafted by Martha Sharp Joukowsky).

diagonally dressed sandstone ashlar with curved ashlar fronting the structure. The interior is embellished with four buttresses set between five niches each measuring approximately 2 m. Below the central niche is a red sandstone and limestone platform curved to abut the north face of the wall. It measures 1.63 m in width-by-0.34 m in depth and it is 1.65 m in excavated height (Its top courses are exfoliating and require consolidation). Except for that area taken by the platform, a bench of rough sandstone ashlar leveled with chinking stones encircles the interior; in the northwest its preserved height is 0.50 m. The flooring remains are comprised of sandstone flagstones oriented north south. Like the West Exedra, twin columns graced the entry of the exedra building — the western column (diameter of 0.38 m), is preserved to four drums or to a 2.14 m height, and the eastern column to five drums and to a preserved height of 2.6 m. Engaged columns define the exedra on both the east and the west with their walls bonding with those of the exedra. Sandstone and limestone architectural fragments of the exedra entablature were located just north of the structure where the corners of the pediment and curved cornice blocks were recovered. The evidence thus suggests that a broken pediment originally graced the East Exedra. To date, the East Exedra is the only structure for which we have evidence for an entablature. Now from the East Exedra there is a grand vista over the Lower Temenos triple colonnaded walkways, which originally were adorned with Asian elephant-headed capitals.

At a later time a lead pipe 10.1 m in length with a 0.09 m diameter was inserted into a crude cut through the engaged column, which appears to have its origin in the 'Lower Market' lying to the east. This piping probably extended across the Lower Temenos along the East-West Retaining Wall to the West Exedra extending to a length of

32.7 m.

Also excavated was a large section of the triple southeast Colonnade — including the area occupied by the nine southernmost columns. The East Colonnade extends up to the East Exedra. At a later time, extensive changes were made after the original exedrae and colonnades were constructed, for the East Colonnade stylobate has seen extensive damage, which indicates there was rebuilding, reuse and redesign of the area. In some cases there was reuse of stylobate sections and between the western columns rough Inter-Columnar walls were constructed with reused architectural elements. At some point in time, the easternmost colonnade probably went completely out of use and its drums were moved and reused in other areas in the Lower Temenos. A possible lime kiln here suggests that in a later phase this area may have become a quarry for decorative limestone temple elements. Additionally a later oblique wall (2.4 m in length-by- 0.5 m in width) was constructed in the southeast for as yet an unknown purpose.

### *Relief Sculpture*

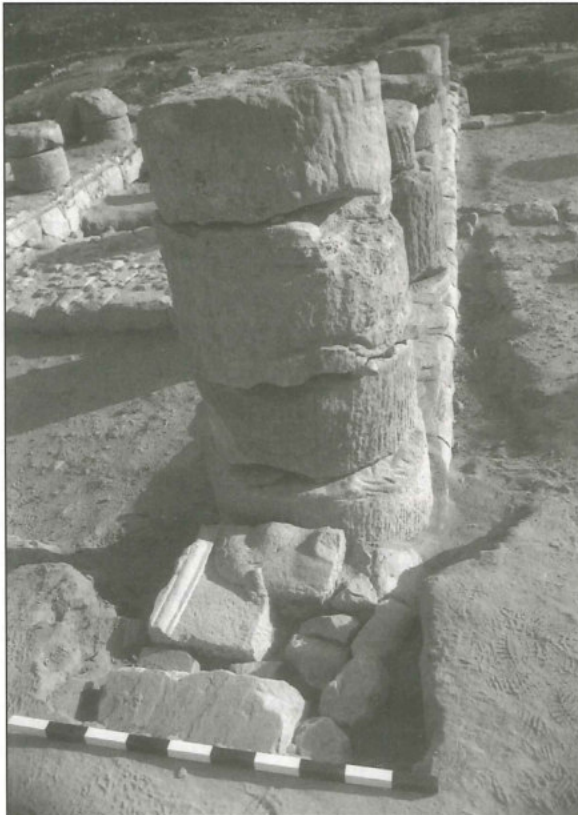
We were fortunate to find the East Colonnade Inter-Columnar wall and the aforementioned oblique wall to contain extraordinary architectural relief pilasters from the Temple façade. These elements probably fell from the Temple and were found built into the Lower Temenos inter-columnar walls, serving as recycled building components by the precinct's later builders, for the following relief-sculpted torsos were recovered lying upside down in a gray mortar deposit that extended throughout the trench. Between the stylobates was the relief sculpture of a female (Fig. 12) measuring 0.52 m in height, 0.84 m in width and 0.38 m in thickness wearing a chiton and holding a cornucopia in her left hand. The hair in ringlets falling over her shoulder was apparently in vogue in Petra — the



12. 1998, Relief of a Woman Holding a Cornucopia (Artemis A. W. Joukowsky).

same iconographic scheme is evidenced by very similar styles and comparable ringlets found on two of the masks found in the Temple West Walkway in 1994.

In Special Project 54 of the Lower Temenos, in the central line of columns in the triple East Colonnade was found the torso of a woman (Figs. 13-14). Bordered by a partial cyma reversa and carved in the “wet



13. Lower Temenos Inter-Columnar Wall with the relief of a woman *in situ* (Artemis A. W. Joukowsky).



14. Relief of a Woman (Artemis A. W. Joukowsky).

drapery” style lying upside down as part of the inter-columnar wall, she was recovered next to the fifth column from the north.

Measuring 0.53 m in width-by-0.38 m in height, this Amazon or Aphrodite-like figure has her left battered breast exposed; she wears a chiton with a braided border and delicately fashioned button fastenings extending down her right arm. Built into a southeast oblique inter-columnar rubble wall was the sculpted panel of yet another figure in low relief with its right bust exposed and with a chiton over the left shoulder. Including the cyma reversa this figure measures 0.50 m in height, 0.85 m in width. Most of the pilaster figures were headless — we reason that the heads were not destroyed by the iconoclasts, but rather these torsos were fitted with separately sculpted heads, perhaps sculpted by a special school of sculptors. The heads were mortared in place before the finishing touches were given to the block. Additionally re-used and installed as part of the south inter-columnar wall’s west face was an exquisite low relief (Fig. 15) of an ornamental wreath embellished with a ribbon tied at its top, measuring in length 0.82 m, in width 0.52 m and 0.24 m in thickness. J. J. Basile will discuss the details of these panels in detail.

23% of the total architectural fragments registered from the 1998 season were recovered from Trench 52, and of these 27 sculpted elephant fragments were cataloged.

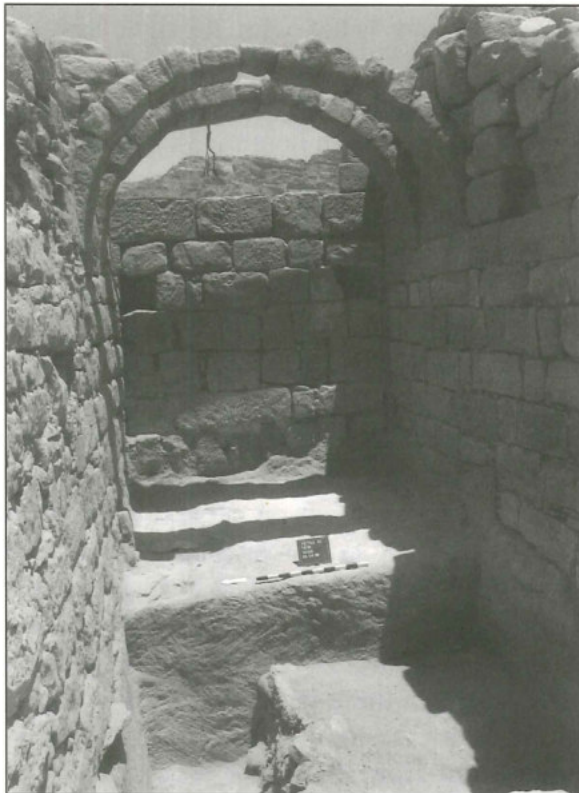


15. Low relief of an ornamental wreath built into the Lower Temenos East Colonnade Inter-Columnar wall (Artemis A. W. Joukowsky).

As for Y. Gerber's reading of the pottery, this area's closing date is placed to the early fourth century.

#### *Upper Temenos*

Fully revealed behind the East Exedra was an arched structure we have identified as a 'cistern' measuring 11.05 m east-west-by-3.15 m north-south-by-5 m in depth (Fig. 16). The vaulting of the cistern shares the



16. 1998, 'Cistern' in the Upper Temenos behind the East Exedra (Artemis A. W. Joukowsky).

rear wall of the East Exedra. Seven vaulted arches span from the East Exedra to its south wall. Constructed sometime later, a narrow (1.1 m) seven-step service staircase connected the eastern stairs and this "room." This area was thoroughly investigated save its southwest balk, which was purposefully left *in situ* to support the collapsed porch columns of the Temple east. The bottom of the 'cistern' was cut out of bedrock to a 1.7 m level below a later built plaster floor.

Although we have tentatively identified this feature as a cistern, its purpose has been questioned due to the fact that the plaster on the walls is decorative rather than the usual hydraulic plaster found in other parts of the site. Could this have been a decorated cistern? Or was the elegantly colored plaster in use when it served in yet another capacity? At this point there is no other reasonable explanation for this room, so we will suggest that it was originally constructed as a cistern. Finally, the pottery suggests that in ca. 100 BCE, this area functioned as a dump.

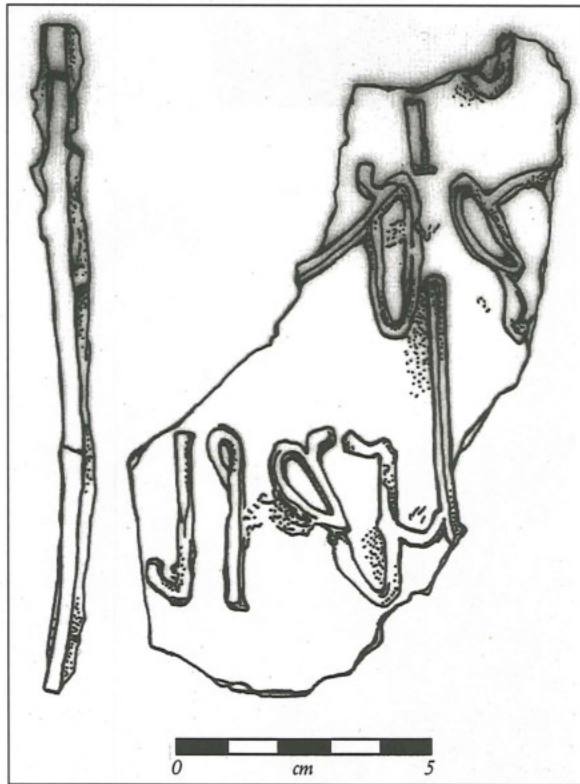
Above the cistern level large amounts of white marble were stored in the eastern part of the room. The excavator, L.D. Bestock, reasons that this area then served either as a storage area or as a marble workshop, for what might have been the remains of metal tools also were recovered in the same deposit. Associated with the workshop phase is a bronze plaque measuring 0.14 m in length-by 0.62 m in width-by-0.05 m in thickness. Shown in Figs. 17-18, it carries a Nabataean eight-letter inscription, that when translated may be a reference to a king or queen of Petra. This reading is tentative and will have to be confirmed by epigraphic experts. A smaller bronze fragment measuring 0.052-by-0.033-by-0.07 m was found, but unfortunately it does not fit the larger fragment although originally it probably belonged to it.

Above and around the stored marble





17. 1998. Bronze plaque with Nabataean inscription 98-M-2 (Artemis A. W. Joukowsky).



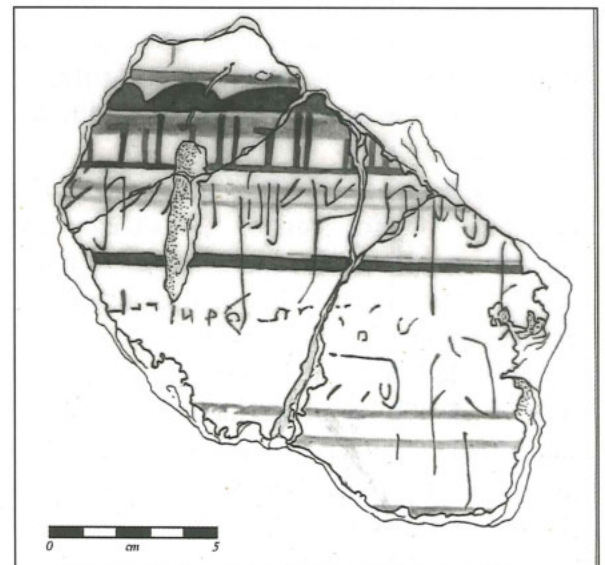
18. 1998. Bronze plaque with Nabataean inscription 98-M-2 (Drawn by Simon M. Sullivan).

blocks was a deep dump deposit, which sloped from west to east. Found was a plethora of exquisitely decorated plaster, including two wall fragments with partial

painted Nabataean inscriptions, Figs. 19-20. A provisional reading of the larger inscription by Suleiman Farajat is "Abd as-Salām," in English, meaning, "Servant of Peace." It is written in a script similar to that appearing on the at-Turkmaniyya tomb (McKenzie 1990:35) which Starcky dates to Malichus II, or to the middle of the first century CE. Also recovered were a Pompeiian red fresco fragment with an incised Greek inscription or graffito, the fresco fragment of a man's face (Fig. 21), and fragments of molded plaster, some of which were gilded. Also found were fine pottery, glass, bone implements, several Nabataean coins, shell and tesserae. Two architectural



19. 1998, Nabataean inscription on plaster (Artemis A. W. Joukowsky).



20. 1998, Nabataean inscription on plaster (Drawn by Simon M. Sullivan).



21. 1998, Fresco of a man's face, Cat. no. 98-S-65, L. 7.32 cm, W. 4.85 cm, Th. 3.26 cm. The iris of the eye is pale blue (Drawn by Simon M. Sullivan).

fragments are of particular interest, including a lower order exquisitely carved smaller than usual acanthus capital measuring 0.55 m in diameter carved with a grand bouquet of acanthus around its circumference. Additionally there was a Nabataean blocked out capital measuring 0.26-by-0.28-by 0.34 m, McKenzie's type 3 (1990:190) which is the first of this type we have found at the Temple site. McKenzie (1990:122) dates this type of capital to AD 129 from those found at ad Dayr and the Palace Tomb. These elements are different from those heretofore associated with the temple contexts.

These excavations also produced a full repertoire of first century Nabataean fine painted and plain wares with some complete forms. The Nabataeans liked to drink and eat from their decorated pottery — marvels of both lightness and strength with their well-fired thin wares that have a ring almost like crystal. The quality of these finds suggests that this dump deposit might possibly date from the time the Temple was being remodeled. The collection was so extraordinary in its range that we wondered if perhaps this could have been a dump for rit-

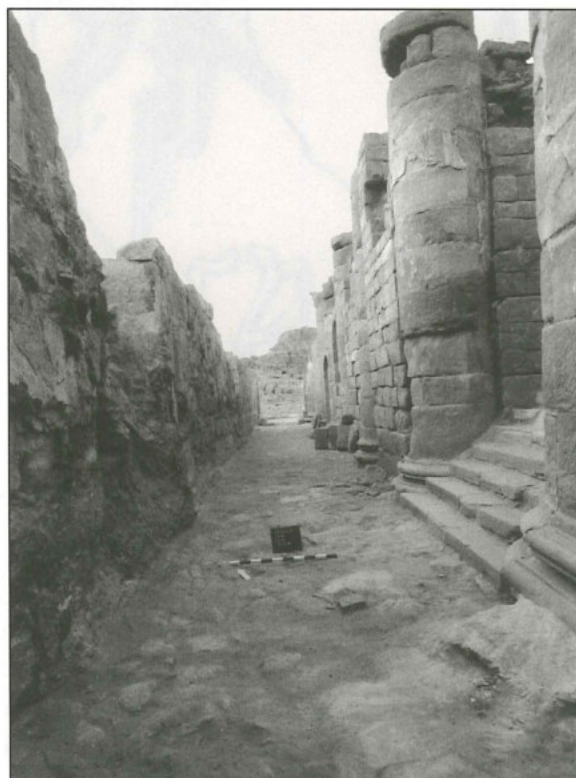
ual artifacts? The pottery read by Y. Gerber from this area places its contexts earlier than 70/80 CE or to the second half of the first century BCE, thus the terminus post quem for this Nabataean Dump is 100 CE.

### Temple

The Temple west saw the excavation of the *West Corridor* (Figs. 22-23) with frescoed walls standing to a 6 m height. This excavated area, between the West Inter-Columnar wall and the West Corridor wall,



22. 1998, West Corridor looking south (Artemis A. W. Joukowsky).



23. 1998, West Corridor looking north, (Artemis A. W. Joukowsky).

covered 20 m in length-by-3 m in corridor width-by an average 5.10 m depth. With its completion, this excavation made it possible to accurately measure the Temple length as 42.5 m.

The earliest building phase, Phase O, saw the construction of the West Corridor floor bedding; Phase I saw the construction of the West and Southwest Walkway walls and seven columns of the west Temple, including the southwest heart-shaped corner column and the two rear columns. This phase also included the simultaneous construction of the West and South walls of the Corridor with their frescoed decoration.

Also excavated was a 4 m portion of the *Southwest Corridor* from the point where the corridor took a turn to the east. It was found that in Phase O the subterranean canalization system was cut into bedrock at the bottom of the corridor floor. The roughly hewn sandstone canalization capstones measured approximately 1.50 m in length, and were irregular and uneven in appearance. Because this feature was recovered on the last day of excavation, it was not fully investigated, but we project the canalization will be found to extend under the east balk of the trench with a probable connection to the canalization found cut into bedrock under the Central Arch.

The corridor pavement bedding consisted of irregularly set stones and in a few areas there were impressions left by the pavement, but no flagstones were recovered. The bedding was found to be damaged by earthquake fall, and the assumed pre-existing pavement of limestone pavers that had been clearly delineated in the Northwest Corridor had been robbed out. What remained was irregular and uneven in appearance.

Shown on the revised plan in Fig. 1 are doorways in the Southwest and West Corridor walls, approximately 2.10 m in width leading into the west and southwest walkways. The southwest doorway had been

purposefully blocked up from the bottom in antiquity; it later may have served as a window. Internal buttresses for the doorways were destroyed to support the door, and in the upper levels, doorjambs were found. Future excavation will confirm the wall thickness although it appears to be at least 1m.

The lower courses of the heart-shaped sandstone southwest corner column were recovered in excellent condition; it stood plumb to a 4.75 m height. As there was a 0.15 m earth accumulation between the upper drums, the two upper courses were removed for their future consolidation and re-erection. With the removal of these drums, the *in situ* bonding plaster was found in fine condition along with large amounts of wood and the remains of metal fittings. Each of the eight remaining drum components was also found to be well bonded and to require little reconstruction. Some of the metal fittings were drawn to scale and samples of the wood were collected for dendrochronological analysis. Each of the eight remaining drum components was found to be well bonded and to require little consolidation.

With the removal of the upper courses of this heart-shaped column, we were able to understand how it had been laid. Just before each element of the hewn column was put into place, it was backed with reeds and plaster. For reinforcement, the Nabataean masons affixed the drum with iron bars that served as clamps to hold the joints between the four or five column drum components. Once in place, more plaster was poured onto the joints, and added to that was yet another plaster coat containing a binder of plaster mixed with ground and crushed potsherds. Once the drums were bonded and the capital was in place, the plasterers moved in to stucco the exterior drum components so their height irregularity would be masked from view.

The best preserved simple rear columns

of the temple rear have as many as 17 single *in situ* drums, rising to an 8.45 m height above the southwest corridor floor. They appear to be in excellent condition for they stand straight having been braced by the Inter-Columnar wall. This southwest area suffered less earthquake impact than either the east and west sides of the Temple.

### *Frescos and Stucco Decoration*

When the visitor views the city of Petra today, most do not suspect that a majority of the carved façades originally were covered with stucco and that these façades were brightly painted. Preserved to a 6 m height the West and Southwest Corridor west and south walls were irregularly built, intentionally constructed to provide the footing for a richly painted plaster decoration. There are many chinking stones in between its irregularly and roughly-set squared blocks that were faced with mortar, so that the thick (0.17 m) multi-plastered layers would gain a secure placement. The frescoes of the West and Southwest Corridor demonstrate that the Great Temple was lavishly stuccoed and painted, and like the Temple of the Winged Lions (Hammond 1977-8:86,91), there is some evidence of fresco motifs that in antiquity were pecked over and re-stuccoed and repainted in plain colors. First a primary coat of between 10 and 20 mm in thickness was laid, to which was added a fine homogeneous 'skin' of about 5 mm which was painted. On the east face of the west and north face of the South Corridor walls were stucco moldings as well as many painted and decorated wall plaster fragments.

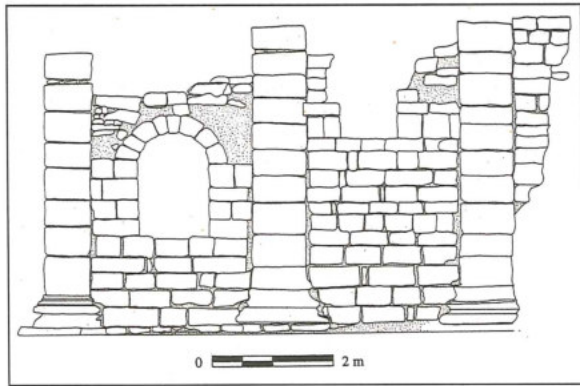
The expertise of Nabataean stuccoists is revealed in the architectural stuccos molded and fixed to decorate the upper parts of walls. Here we found the ornamental repertoire of classical moldings with rows of beads and reels, eggs and darts and denticles, enhanced by color in which yellows, blues, reds, and greens predominate. Often

fragments of bright blue painted cornices were recovered near the doorways, so it is reasoned that these fragments were part of their decorative program. Like fragments can be paralleled (McKenzie 1990:Pl. 23a-c) at the al-Khazna, the Temple of the Winged Lions and the Baths. The areas where smooth stucco decoration survived were decorated with panel fragments of finely-painted plaster in reds and yellows bordered by dark frames (The Munsell readings are dark red 10R3/6 for the main panel, yellow 10YR7/8m for the secondary panel, a greenish gray is 5G 6/1, and the border stripe is weak red or 2.5YR 5/4). The surviving details of the design are not clear, but they may depict an architectural façade, a doorway or entrance. We undertook the preliminary consolidation of one large, 2.80-by-1.00 m in height, fragmented fresco, by supporting it with a mixture of sand mortar and nails as reinforcement (Not only were many dowel holes found in the plaster to provide support, but several dowels with their plaster surround were recovered).

### *Temple Southwest and the Inter-Columnar Wall*

Phase II, the second and later building phase, saw the construction of the Inter-Columnar walls extending between the columns. Particularly impressive were the pristine condition of windows and arches of this western Inter-Columnar wall drawn in Fig. 24 — they appear as if they were recently constructed. Typically this west wall's neatly dressed ashlar exhibited fine diagonal tooling, tilted at forty-five degrees, used for keying the stucco, but only traces of the original stucco remain.

As part of the excavation of Trench 59, the east-west southwest stairway (Fig. 25) was completely excavated. The width of this stairway measures 2.42 m and its length is 9.50 m. Although the upper stair treads had been robbed, the bottom seven courses



24. 1998, West face of the West Inter-Columnar Wall (Field drawing by A. A. W. Joukowsky, drafted by M. S. Joukowsky).



25. 1998, Southwest Stairway extending down to the West Corridor, before conservation (Artemis A. W. Joukowsky).

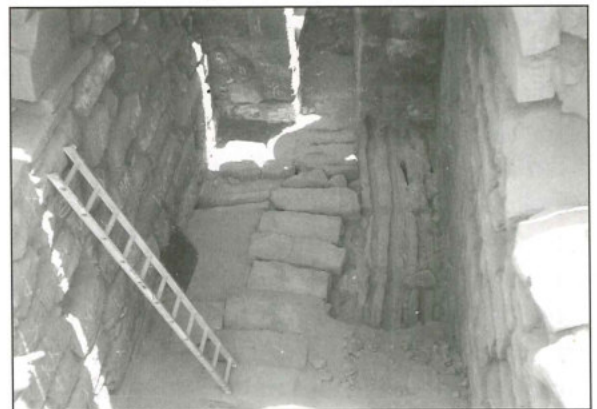
were intact and *in situ*. A large number of architectural fragments were found in the collapse resting on these stairs, including several quarter fragments of the upper order of capitals. This may be an indication that the earthquake tremors in this part of the structure shook these walls to tumble first to

the west and then to the east. On the basis of Nabataean fine wares, the earliest deposit here is dated from the last quarter of the first century BCE.

### Central Arch

We anticipated the Central Arch to be an architectural feature whose purpose was only as a support structure for theater seating. Highly informative was the tedious 1998 excavation of the arch and the chamber below it. After repeated three season attempts to stabilize the arch, we were finally able to complete its stabilization and excavation. Despite the recovery of ashlar and decorative architectural fragments that had tumbled from above into the arch area, it was our good fortune to find that the majority of the arch remained intact. The preserved height of the arch averaged approximately 3 m from its underside to the floor below.

Cut into bedrock, the arch chamber floor, measuring 8.52 m-by-3.32 m was comprised of a larger four-channeled canalization system with an additional smaller series of subsidiary shallow bedrock-cut roughly parallel channels (Fig. 26). The opening depth of the larger channels was at 885.848 m and the closing depth was at 885.548 m. The north-to-south line of capstones in the larger main channel consisted of regular capstone construction characteristic of the temple canalization found in the



26. Central Arch showing the Canalization (Elizabeth A. Najjar).

temple Pronaos and Forecourt in earlier years. These capstones were longer than they are wide with average measurements of 0.50 m in length, 0.35 m in width-by- 0.19m in thickness; they rest on chinking stones which were set above the bedrock cut canalization wall to level them.

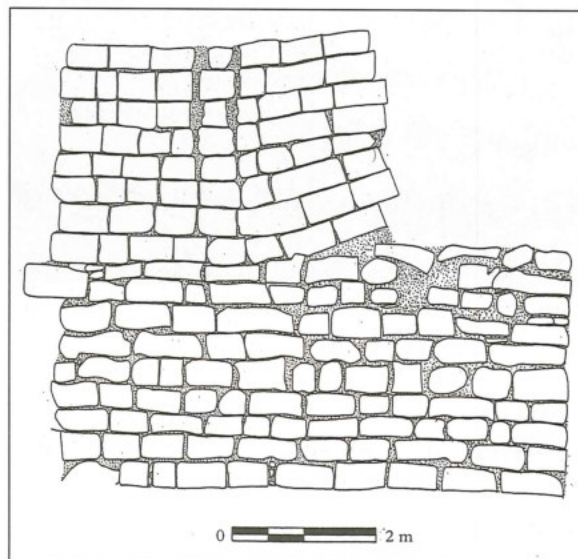
In order to expose the interior of the canalization and to collect soil samples, several capstones were removed. Within the canalization was a Munsell 7.5YR 3/4 dark brown fine silty deposit, increasing in depth as the canalization descended from south to north. Found here was a Nabataean cup. The canalization walls were mortared with a thick, water-resistant very dark gray (Munsell 5Y 3/1) hydraulic cement with inclusions of small rocks and potsherds.

In the areas where the capstones were removed, sondages determined the character of the canalization. Initially it was postulated that it was cut into the bedrock in a strictly north-south direction, traveling beneath the southern doorway to the as yet unexcavated south and to the north to continue beneath the north wall, and presumably from there into the central Temple. Beneath one of the capstones there was found an east-west intersection, forming a "T" shaped junction. The east branch continued to the east wall, whereas the western branch was followed to 0.3 m under the west wall. Thus once again the Phase 0 canalization confirmed that it predated the Temple Inter-Columnar walls of Phase II and the Phase II walls of the Central Arch.

Lying above the Canalization System was hard-packed clay "floor." In this Phase I building phase the canalization system was blocked off. The smaller shallow water channel systems were also blocked off; the channels were filled with debris and the clay "floor" was laid down so that the Central Arch chamber walls could be constructed. Although the north and south portions of the arch have collapsed, the portion that remained consisted of roughly hewn

sandstone ashlar measuring on average 0.35 m-by-0.55 m, set in rows of eight. Its 16 courses are set parallel to the bedrock in the southern half of the arch, and they then begin an upward tilt and are built-up towards the north at an angle of 60° which can be seen in Fig. 27. The arch would have extended towards the north wall, which most likely was built up to support it. The arch sandstone ashlar are of better quality than those in the supporting walls below. It is justifiable that these stones were hewn and placed with deliberate care in order to support the load-bearing weight of the theater seating. (Tentatively, we assume that the public may not have viewed the underside of the arch, but, rather that it served as a support structure for the theater seating.) It appears that the chamber below may have served not as a public space but as a store-room, during at least one of its later use phases.

In the Phase III debris above the floor were 160 coins, tentatively dated to the Late Roman period or to the second century CE. This cache was recovered from a 0.8-by-0.8 m square of deposit. Comprised of a compact, artifact-rich layer of moist, clay-like greasy soil which is patchy in areas, this de-



27. Central Arch West Wall (field drawing E. Libonati, drafted by M. S. Joukowsky).

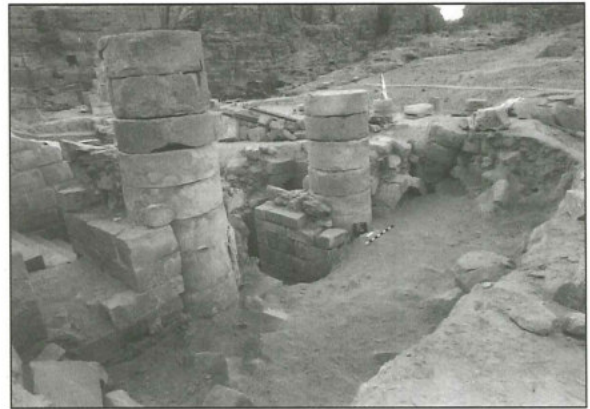
posit contained bones, burnt residue, charcoal, limestone chips, plaster chips, shells, and some sand. Artifacts included the cache of coins, along with glass, tesserae, and metal nails. The 101 architectural fragments found in this third phase include: cornice, 27.7%; acanthus leaf, 21.8%; vine, 18.8%; and other decorated fragments of pomegranate/poppies, corner volutes, pine cones, flower petals, including hibiscus petals, and cauliculi.

The pottery varied in date and large storage vessels were predominant, although jars, jugs, cooking pots, and Nabataean fine wares were also present. Cat. No. 98-L-2 was a complete Roman lamp in excellent condition that parallels a late third century CE lamp (Rosenthal and Sivan 1978:96). This lamp has a depressed discus, a small central filling hole, a perforated handle, and a rounded spout. The lamp is of pink clay, a Munsell red 2.5 YR 6/6 with splashes of red slip on its upper half. From the preliminary analysis, the closing date for the Central Arch deposit ranges to the fourth century CE.

### *Temple East Corridor*

Also in 1998 we recovered more of the East Corridor. Trench 58 was a continuation of excavations undertaken in 1996 with dimensions of 11 m north-south-by-3 m east west. The purpose of excavating this area was to remove fallen columns and capitals congesting the east corridor and to expose the East Corridor wall. Here the initial deposit was clogged with fallen column drums decorated with fruit and acanthus-laden Nabataean floral capitals. Several drums of the Temple East were removed, stabilized, and re-erected. Figure 28 shows the East Corridor after clearing.

A number of architectural features in the Inter-Columnar wall overlooking the rear east stairway were exposed including two arched windows and an arched doorway. In addition, several elegantly carved floral cap-



28. East Corridor after clearing (Artemis A. W. Joukowsky).

itals were unearthed as well as two extraordinary pine cone bosses. Other registered finds from Trench 58 included many red, white and yellow fragments of wall and column plaster, one oxidized coin, and several roof tiles that suggest this served as a storage facility. For temporary safekeeping, the architectural elements were placed along the East Side of the Upper Temenos. As a substantial portion of the fallen columns and capitals on the Temple east had impeded excavation, it is now cleared so that it can be excavated in 1999.

### *A Word About the 'Lower Market'*

To the east of the Temple precinct lies the so-called 'Lower Market,' which from our preliminary survey appears to be part of the Temple precinct. This we have confirmed was not a market at all, but is instead an enclosed formal garden with a large pool, reminiscent of a Persian *paradeisos* or pleasure park. In the center of the pool was a bridge leading to an island with the remains of pavilion embellished with marble and painted plaster. More about this unique well-preserved extraordinary feature will be reported on by L-A. Bedal who directed its excavation and research.

### *1998 Catalog*

In the 1998 catalog were 186 coins, the fragmented bronze plaque with the Nab-

ataean inscription, painted stucco, 40 additional elephant parts, 37 lamp fragments, and 24 Nabataean bowls, cups, unguentaria, and figurines. Since 1993 nearly 34,000 fragments of pottery, bone, metal, and glass now have been classified in our site database. After six excavation seasons, the catalog register includes 382 coins, several inscriptions including three in Nabataean; several fragments in Greek, and an Imperial Latin inscription (Tracy 1999:372-376). Exquisitely painted stucco fragments abound, including one with a partial human face shown in Fig. 21. 146 sculpted elephant fragments are included in our architectural fragment database numbering over 6274 elements, along with fragments of elaborate floral friezes and acanthus-laden limestone capitals. 379 lamp fragments, complete Nabataean bowls, small cups, jugs, unguentaria, and figurines are among the 149,640 pottery, glass, bone, and metal artifacts classified in our site database.

As specialist study is integrated to our research, J. J. Basile is studying the sculpted pilaster blocks from the Lower Temenos; C. Augé will be analyzing the coins, D. G. Barrett has researched the lamps, S. G. Karz the glass, and the stylistic analysis and dating of the pottery already has been undertaken by Y. Gerber.

Found in the pool-cistern in the courtyard of the Petra Church excavations was one of the Lower Temenos elephant head fragments (no. 661 1998), as well as the hibiscus petal from the upper part of a Temple capital (no. 662 1998). It is clear that the Byzantine Church builders "borrowed" the attractive architectural elements they found lying around the site.

#### *1998-1999 Consolidation and Restoration*

The fundamental philosophy of the Petra Great Temple excavations from the beginning has been that the site is a fragile, non-renewable resource that would require

protection. One of our concerns before excavation was undertaken was that we would make every effort possible to consolidate the site while the excavations were in progress. It should be made clear that we have not undertaken architectural restoration, in its true sense — restoration awaits further excavation and the expertise of an architectural historian. The measures we have taken are geared only to the reversible preservation of the structural integrity of the precinct. Exposure of the architectural features has been of serious concern, for the site is susceptible to the havoc created by heavy rains and earth tremors. This has been acknowledged and instituted by the incorporation of several additional consolidation procedures that have become part of our research design.

One of the crucial by-products of excavation is the state the archaeological site is left in after excavation. Because archaeology is a destructive science, how does the site live on after it has been excavated? Conservation and consolidation are expensive, tedious, labor-intensive endeavors that require specialists and skilled technicians. It is hoped that we have helped to preserve this monument and its precinct, for we have routinely maintained records of both the condition and treatment of the various site sectors that we have participated in recovering. Approval to carry out conservation was vigorously supported by the Department of Antiquities of the Hashemite Kingdom of Jordan. Aware of the threats caused by winter rains and earthquakes, Dr Ghazi Bisheh, then, Director-General of the Department of Antiquities, was anxious to have consolidation carried out during the excavation or as soon as possible after the close of the excavation season. During our annual excavations, consolidation plans have been undertaken, and those measures that interfered with the excavation process were postponed until the excavations had concluded. Each year we envisioned a more extensive,



organized plan for the consolidation of the Great Temple architecture, which has been on-going under the expert guidance of Dakhilallah Qublan and some 20 local workmen. We have also made several studies of consolidants<sup>5</sup> for the conservation and restoration of standing structures. We have also diagnosed a wide variety of sensitivities in order to slow the process of sandstone and limestone deterioration. With this in mind, yearly conservation surveys of the excavated portions of the Temple have been carried out with a view to preserving and restoring various architectural features.

Now that all the temple columns have been located, their reversible re-erection has been undertaken. On occasion mortar has been used between the drums — as was the case with the entry columns of the West Exedra and the restoration of the East Colonnade. Using a tested mortar, which in composition is similar to the original Nabataean mortar, we have consolidated architectural elements — the aforementioned columns and walls that have been imperiled both from 2000 years of erosion as well as by recent excavations.

Applications have been made to the World Monuments Fund, which has granted us two awards (1996 and 1998, respectively) expressly for site preservation, conservation and consolidation. Thus the Great Temple consolidation projects have been made possible in part by a grant from the Samuel H. Kress Foundation through an American Express Award through World Monuments Watch, a program of the World Monuments Fund. These funds were matched several times over by special subventions through donations to Brown University. Briefly stated, budget constraints

have forced us to be selective of what we could undertake.

Among the completed projects involving the consolidation and conservation was the anastylosis and re-erection of 11 courses of the heart-shaped southeastern column of the Temple rear. The East and West Stairways leading from the Lower Temenos to the Temple Forecourt were also restored and also completed was the anastylosis of the West Corridor east Inter-Columnar wall along with its arches and windows. Beginning with the Temple precinct north, the following list of projects was scheduled for 1998-1999 consolidation — I am pleased to report they all have been completed.

- \* The Propylaeum's arch springers were in a state of collapse and required consolidation. Consolidation has taken place.
- \* In the Lower Temenos, six columns have been restored to different heights in the East Colonnade to a maximum of 6.80 m height (their original height we assume was 8 m). One of the elephant-headed capitals from the Temenos Gate was placed on top of the highest column so that visitors will have an understanding of the layout and sculptural canon of these features (Fig. 29). The East Exedra urgently required stabilization — this was undertaken with the replacement of deteriorating blocks that had weakened the structure and its integrity; it was in danger of collapse — consolidation was completed.
- \* In the Upper Temenos, the 'cistern' required its walls to be pointed and reinforced; its two free standing arches also required re-pointing (these arches were first stabilized in 1997). The steps leading to the West Walkway had to be re-

5. Whether or not these mortar consolidants have limitations is a complex question. Stone, particularly sandstone deterioration is appreciable in the Temple's erosion. The long term efforts of the mortar on the sandstone is difficult to predict. It is a matter of judgment of the conservator. For each

stone there are differing porosities, differing salt, water and acid absorption rates and difference in how they react to sunlight. Here is a very complex question, for each individual stone has its own problems.



29. Lower Temenos Restoration of the East Colonnade with the placement of the Elephant-headed capital on top of the column (Dakhilallah Qublan).

placed for some of these were broken and slumped out of position, while others had been robbed out. Consolidation was completed.

\* In the Temple itself, the Central Arch exhibited complex needs, for it required collapse prevention by the construction of a wall of 55 ashlar blocks built up to stabilize the arch. Another project entailed the southwest heart-shaped column's upper drum elements which were restored to their original positions. The Southeast East-West stairway has some 23-24 steps; all but the lowest seven steps were robbed out in antiquity. For passage into the structure some 18 or 19 steps were replaced with new treads. As for the southwest east-west stairway, where the condition was similar, these steps were also replaced. The West Corridor frescos were treated during the field season, but they required further cleaning, stabilization, support and protection to prevent their disintegration. Finally, the fallen ashlar blocks that were originally part of the West Corridor wall were replaced to their original positions. Additionally, the protective

fencing surrounding the site again had to be increased for the surround of the excavated areas, but also to protect our "Sculpture Garden" where pilaster blocks and decorative capital elements are stored.

### 1998-1999 Publication

The 1998 publications included the basic reference to the 1997 excavations in *ADAJ* as well as Associate Director J. J. Basile's coverage of the Tyche head. We now await the multi-disciplinary publication of *Petra: The Great Temple, Vol. I — Brown University Excavations 1993-1997*, with its accompanying CD-ROM.<sup>6</sup>

### 1998-1999 Research Projects

- \* Erika L. Schluntz defended her Ph.D. dissertation entitled *From Royal to Public Assembly Space: The Transformation of the "Great Temple" Complex at Petra*, at Brown University. This valuable work seeks to test the idea of the function of our complex. With essential theoretical ideas Erika questions and challenges the building's identification and argues convincingly that it served a civic function.
- \* Adam Brin of Brown University revamped the Petra Web page which can be accessed at <<http://www.brown.edu/Departments/Anthropology/Petra/>>.
- \* Eight Great Temple fresco fragments were analyzed by the Institut Canadien de Conservation under the direction of M-C. Corbeil and K. Helweg. The results of their findings are presented in ARL Report 3779, dated March 19, 1999. The fragments analyzed originated in the Trench 53 'cistern' area in the Upper Temenos East. In summary the report states that the fresco support was contained mainly of sand (quartz) with a small amounts of

6. As this five year report is in press I am conscious of the fact that some of the material already has become dated due to the pace of our excavations. It is hoped that this volume will promote catalysts for ideas among archaeologists and will broaden

public awareness of and support for our work. The publication of a revised and expanded Volume II report will be undertaken as the conclusions of our excavations in or around 2004.

calcite and traces of gypsum. No organic binding medium was detected. Two green fresco fragments were identified as green earth; the red fragments were of red earth — a mixture of hematite and associated minerals such as kaolin. Two blue fragments were identified as Egyptian blue which the researchers mention has been found in Pompeii and at Dura Europos. The yellow pigments were yellow earth, i.e., a mixture of goethite and associated minerals such as clays. One black colored fragment held a yellow layer underneath its black surface. The black was a carbon-based black whose source was undetermined. The analysis also suggested that the Great Temple frescos are true fresco — there was no binding medium and the pigments were placed directly onto the wet support. These same pigments were found on frescoes from the Roman fort excavated by John Oleson al-Humayma.

\* E.L. Vote processed data from a 1998 photogrammetric survey of selected areas of the Upper Temenos. While in Petra she produced a series of measurable photos with a calibrated 35 mm camera and referenced control points plotted on temple elevations. The control points were confirmed by our team surveyor, P.C. Zimmerman. Vote has succeeded in producing 3D models of several areas with a high level of accuracy. For example, over a span of 1 m, measurements generated from the photos were approximately 6 mm different (per one meter of elevation covered) from control points taken from the EDM survey. Working with the measured photos she produced a modeling software package developed by the Brown University Graphics Laboratory with the hope of generating a model of the extant architectural remains and a full reconstruction.

Additionally she has been working with GIS results to plot artifacts in the context of the entire Great Temple excavation. This will enable her to generate a variety of 3D site diagrams with concentrations of different artifact finds in trench and locus locations.

### Conclusion

The Great Temple contains eclectic exquisite art and architecture from the Nabataean period and demonstrates that the values of the Nabataeans of Petra during this period who felt that aesthetic decoration of structures with frescos and architectural sculpture were sufficiently significant on which to expend time, money and energy. This blending of different cultures is seen in this palatial building and its precinct with the use of elephant heads, frescos, elegantly carved pilasters and capitals. There is a high level of skill and technology possessed by these builders as well as a high level of organized government that was required to construct this monumental structure. The Great Temple is one of the key sites in the Nabataean Petra, and it is a significant for our knowledge of the development of the city. The lives of the Nabataeans were influenced by a unique blend of cultures, and the Great Temple is no exception. Its study enriches the web of knowledge we possess regarding both Petra and the people who created it. The 1998 season at the Great Temple proved to be provocative and propitious as many more questions were raised about this fascinating precinct.

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