Paradise Found: Petra's Urban Oasis

by Leigh-Ann Bedal

The ruins of the ancient city of Petra ("rock" in Greek) lie in the mountains that form the eastern border of the Wadi 'Arabah, marking the boundary between Palestine and Transjordan (Fig. 1b). For three centuries (ca. 168 BCE–106 CE), Petra was the capital of the Nabataean kingdom that prospered from its location at the hub of international caravan routes (see sidebar on Petra, p. 31). Recent excavations undertaken by Brown University under the direction of Martha Sharp Joukowsky have focused on the Great Temple, a pre-eminent monument situated in the ancient city's civic center.

In 1994, as a graduate student in anthropology at the University of Pennsylvania and a MASCA Fellow, I went to Petra as part of a team assembled by MASCA (the Museum’s Applied Science Center for Archaeology). The team’s mission was to provide technical services for the Great Temple excavations (see also Zimmerman, this issue). My main responsibility was to collect samples of pottery and to carry out neutron activation analysis of these samples at the Missouri University Research Reactor. Since sampling ceramics was not a full-time occupation, I also worked as an excavator, a position I happily retained for three additional
extraction seasons. By 1997, excavations in the Great Temple had revealed its unique nature (Joukowsky 1998), and additional information about its context was needed/desired to interpret its function and role within the urban center of Petra.

Despite decades of excavation and around Petra, our understanding of this ancient city is incomplete largely because significant pieces of the puzzle have not been investigated. One of these is a large open area, the so-called Lower Market (Fig. 1a). Its location, monumental scale, and labor-intensive construction suggest that it was part of the ceremonial, economic, and political center of the city, and therefore must have been of some importance. The fact that the main access into the "Lower Market" was through the adjacent Great Temple complex suggests that the two areas were closely linked and that archaeological investigations in both areas would prove to be mutually beneficial.

So with the goal of determining the function, organization, and historical development of the site, I was the field director during a two-month field season in the summer of 1998 for a survey and excavation in the "Lower Market" under the auspices of the Brown University excavations.

Possible Marketplace?

The creation of the "Lower Market" must have required enormous effort. First, a large shelf (65 by 32 m) was carved into the rocky slope east of the Great Temple, leaving vertical escarpments 16 meters high on the south and east. The bedrock shelf was then connected to a retaining wall 53 meters to the north by filling in the intervening space with a large earthen terrace (65 by 53 m). The terrace is devoid of visible architectural features, with the exception of a short stretch of low wall at its center. A monumental wall runs east-west along

the juncture between the shelf and the earthen terrace, bisecting the site. A deep layer of earth had accumulated to the south of this East-West Wall on the bedrock shelf, forming a plateau 2.5 meters above the level of the terrace. At the center of the plateau, the ruins of a rectangular structure are clearly visible at the surface (Figs. 2 and 3).

The initial identification of the site—along with the adjacent "Middle Market" and "Upper Market"—as a marketplace was made by the German expedition of Bachmann, Watzinger, and Wiegand, who completed the first extensive mapping of Petra’s city center (1921). Since no excavations were conducted at the time, however, this identification was based primarily on the most prominent shared characteristic of these sites—that they were large, open, unbuilt areas—and the expectation that a major entrepôt such as Petra would have had a large, centralized marketplace. Despite its importance as a hub of the caravan trade during the Hellenistic and Roman periods,
Fig. 6. The northeast corner of the pool with staircase and pavers, looking north. At the top of the photo, the impressions of two parallel pipelines can be seen in the cement lining of a channel. A filter basin (with capstone partially covering it) is just right of center.

Fig. 7. Cutaway view of the island-pavilion. The pavilion is reconstructed here as a four-columned hall with open doorways on all sides (the rear door is hypothetical), and a flat, earthen roof. The vaulted bridge was a later addition dating to the early 2nd century CE, when a number of renovations were undertaken in Petra under Roman annexation. Reconstruction by Chrysanthos Kanellopoulos.

little is known about the organization of Petra's economy. We hoped that systematic study of a marketplace would provide valuable information about the city's economic activities, as well as the nature of the association between the area and the neighboring Great Temple.

**Survey and Excavation**

Work began with the creation of an accurate map of the topography by the project's surveyor, Paul Zimmerman (see his article, this issue). Relevant surface features and architectural components revealed through subsequent excavations were added to the overall site plan (Fig. 2). Excavations focused mainly on the southern half of the "Lower Market" where the only substantial architectural features were visible, and a major clearing effort was conducted along the west half of the East-West Wall.

The unexpected result of the 1998 season was the discovery that a monumental open-air
pool with island-pavilion had occupied the entire southern half of the "Lower Market." Much to our surprise, it has turned out that the "Lower Market" was not, in fact, a marketplace, but a luxurious pool-complex most likely associated with a formal garden (Bedal 1999).

**POOL**

The East-West Wall had functioned as a dam, transforming the quarried-out space to the south into a large reservoir or pool (interior dimensions: 43 by 23 m and 2.5 m deep). Clearance of earth and rubble from the wall revealed it to be a monumental construction: the exterior faces are made up of the close-fitting sandstone ashlar (large rectangular stones) typical of Nabataean masonry. Between the faces are alternating rows of roughly hewn sandstone blocks and rubble, bonded into a solid mass with an impervious white mortar (Fig. 4). The entire interior of the pool—including the south face of the East-West Wall—is lined with a thick coat of concrete (Fig. 5) such as is typically used to line the reservoirs and cisterns found in many Nabataean settlements (Hammond 1967:39). The top four steps of a staircase leading to the pool's floor were uncovered in the northeastern corner (Fig. 6), and four rectangular pavers found along the eastern edge of the pool indicate there was a nicely paved promenade around the perimeter.

**THE ISLAND-PAVILION**

In the center of the pool is an island-pavilion whose remains had been visible at the surface before excavation began. The pavilion is built on a rectangular base, a solid foundation 2.5 meters high of tightly packed sandstone bonded with an impervious white mortar. Water was kept from seeping into the foundation by a thick layer of concrete, the same concrete that lines the interior of the pool. The pavilion is rectangular in plan (11.5 by 14.5 m) and open on at least three sides (Fig. 7). The front (northern) doorway measures 4.6 meters across, occupying almost half the width of the façade; the two side doorways each measure approximately 3 meters in width. It is possible that there was also a doorway located in the rear (south) wall.

The walls of the pavilion are constructed of two rows of sandstone blocks bonded with impervious mortar. A channel cuts diagonally across the floor to connect with a channel that encircles the exterior perimeter of the pavilion, just above the maximum water level of the pool (Fig. 8). It is likely that this exterior channel was originally capped and functioned as an overflow channel between pavilion and pool.

A single sandstone pedestal stands in the interior of the pavilion, near the doorway on the west side (Fig. 9). Remnants of plaster and marble paneling are preserved around the base. This pedestal is most likely for one of four columns that were arranged symmetrically around the pavilion's interior and spanned by wooden beams to support the roof structure. The general absence of roofing material in the excavations may be considered evidence against a pitched roof design. Without doing further excavations, we can only suggest that the pavilion might have been finished with a flat earthen roof (see Fig. 7), much like that proposed for the contemporary temple Qasr al-Bint (McKenzie 1990:Pl. 68b). A minimum proportional height of 10 meters (excluding the foundation) is proposed for the pavilion, based on the width of the front doorway.

Several fragments of marble capital, including two volutes or scrolls, were found in the fill around the pedestal and may be from a Corinthian column capital (Fig. 10). Also found in the vicinity was a distinctive five-petaled marble flower in high relief (Fig. 11). Numerous fragments of worked limestone and marble (capitals, tiles, inlay, molding), some of non-local origin, testify to the investment given to the elaborate adornment of this unique building. Painted stucco fragments in dark red, orange, and bright blue and fragments of stucco molding were found in the fill and give some indication of the décor and color scheme inside the pavilion.
The City of Petra

Petra, one of the great cities of antiquity, is nestled in the rugged Shara’ mountains of southern Jordan, halfway between the Red Sea and the Dead Sea. Though lost to Western scholars for centuries prior to its rediscovery in 1812, Petra and its surrounding region have a long and rich history that spans the Stone Age through the Middle Ages. Major Natufian, Edomite, Nabataean, Roman, Byzantine, and Crusader sites dot the landscape. Nevertheless, it is its Nabataean period for which Petra is best known.

In the late 4th century BCE, Petra became home to a nomadic Proto-Arabic-speaking tribe, and by the middle of the 2nd century BCE these Nabataeans had established a mercantile kingdom with Petra as its capital. Watered by numerous springs, defended on all sides by mountains, and strategically located along the Incense Route connecting South Arabia with Mesopotamia and the eastern Mediterranean, Petra became the pre-eminent city in a kingdom that stretched from the Hejaz to Syria.

Befitting their important position and international power, the Nabataeans adopted Hellenistic and Roman art and architecture—symbols of their cosmopolitan aspirations. Invariably, Petra’s architecture shows an artful blending of Nabataean, Egyptian, Syrian, and Hellenistic traits. Most famous are the rock-cut tombs, numbering in the hundreds. From the ornate al-Khazneh at the entrance to the city, to the starkly elegant ad-Dayr perched on a mountaintop to the west, these tombs are marvelous examples of syncretism. A walk across the site reveals the ruins of many houses, temples, and other freestanding structures as well. The only major building to remain standing in the city center is the Qasr al-Bint temple. Other major structures that have recently been excavated include the Temple of the Winged Lions and the Great Temple.

Many of Petra’s greatest architectural monuments were erected in the 1st century CE, during the reign of king Aretas IV. Within a century of Petra’s annexation by Rome in 106 CE, however, the city began to lose its luster. Later in the Roman period, trade moved northward to Jerash and the cities of the Decapolis. Though still of considerable regional importance in the Byzantine period, Petra would never regain its prominence. By the Islamic period, the city was a ghost town.

Arid and inhospitable, Petra today is home to bedouin of the al-Budur tribe and a major tourist destination. It is also the occasional home to many archaeologists. In recent years, over a dozen archaeological projects have been conducted by Swiss, German, Finnish, Japanese, American, and Jordanian missions. — Paul Zimmerman

Petra is best known for its magnificent Nabataean rock-cut tombs. The Umm Tomb (seen here) dates to the early 1st century CE and was reused as a church in the middle of the 5th century.

Photo by Paul Zimmerman

HEDRAEUS

A recurrent theme throughout the 1998 season was water management. As the reconstruction plan (Fig. 12) illustrates, an elaborate water distribution system was incorporated into the pool. In addition to retaining the pool waters, the East-West Wall functioned as an aqueduct, conducting water to a central holding tank and redistribution point. The aqueduct was apparently fed from the east by a V-shaped water tank perched on top of the eastern escarpment (Fig. 2). The tank is lined with the same concrete as that used for the pool.

Narrow channels carried water along the top of the East-West Wall (Fig. 4). Positioned along these channels are shallow basins—one at each corner and one 4 meters east of the central holding tank—that filtered out sand and silt as the water passed through. In addition to the narrow channel, the east half of the East-West Wall also had a much larger channel in which two parallel ceramic pipes were installed. Although no pipes were found, their rounded impressions were preserved in the concrete lining on the floor of the channel (Figs. 6 and 9).

Excavations at the center of the East-West Wall uncovered the central holding tank. All of the conduits—the east and west channels and the double pipeline—emptied into this holding tank, or castellum diustum, where water was collected and
Fig. 15. A view of the pool-complex and garden terrace of Herod's palace fortress at Herodium. The monumental pool (72 by 46 by 3 m; left of center) has a circular island-pavilion and is bounded on three sides with a colonnaded peristyle.

then redistributed (Figs. 13 and 14). Three post-holes near the southeast corner of the cistern may have secured a lever or sluice gate used to control the flow of water into the tank. Water exited the cistern through a hole near its base and was fed into stone channels which run north and northwest from the East-West Wall under-neath a pavement (Fig. 14). Based on the pres-ence of a monumental pool with island-pavilion and an elaborate system of water conduits con-verging onto a large, flat, unbuilt space, these channels may best be interpreted as part of an irrigation system for a garden. In other words, instead of functioning as a hub of economic ac- tivity, the so-called Lower Market was apparently a verdant place of refuge within the city's civic center. One of the goals of future excavation sea-sons will be the systematic study of the earthen terrace, aimed at uncovering important details about the general layout of the garden and the varieties of plants cultivated there.

**Following a Hellenistic Tradition**

The main access into the pool-complex appears to have been via the adjoining Great Temple complex. Visitors to the temple could stroll freely into the garden through the open triple colon-nade separating the two spaces. The first phase of the Great Temple has been dated by Joukowsky to sometime during the second half of the 1st century BCE, based primarily on the style of its ar-chitectural elements (Joukowsky 1998:136). Both the northern retaining wall and the portico wall, which form the northern façade of both the northern terrace and the Great Temple and face the Colonnaded Street, have been dated to the end of the 1st century BCE at the earliest. This date is based on the discovery of coins of the Nabataean king Aretas IV (9 BCE–40 CE) in an associated floor and foundation trench (Parr 1970:96, fig. 1). Therefore, the architectural and stratigraphic evidence indicates that a major construction proj-ect, including the Great Temple and pool-com-plex, was undertaken toward the end of the 1st century BCE, early in the reign of Aretas IV.

The identification of a formal garden at Petra is remarkable. No comparable feature is known ei-ther at Petra or elsewhere in the region of ancient Nabataea. Ornamental gardens, or paradeions, were introduced to the Mediterranean world following the eastern campaigns of Alexander the Great in the 4th century BCE. The Persian gardens and hunting parks Alexander and his army encoun-tered were described by Xenophon (Oeconomicus 4.13, 4.20–24) and emulated by the Hellenistic rulers that succeeded Alexander. The paradeion was an important element in Hellenistic palace com-plexes as one of the recreational facilities, which included pavilions, pools, fountains, promenades, aviaries, zoos, and theaters (Nielsen 1996).

Only a few other examples of paradeions dating to the Hellenistic and Roman periods are known archaeologically in the region. The earliest is the palace of Hyrcanus at Tyre (modern ‘Ajlun, Jordan), dated to the early 2nd century BCE, which stands at the center of an artificial lake that was surrounded by large park-like enclosures (Netzer 1998). The Hasmonaean dynasty of Judea (168–63 BCE) built a series of winter palaces at Jericho that were set in a large paradeion interspersed with pavilions, banquet halls, enclosed gardens, and swimming-pools (Netzer 1977).

Upon his enthronement under Roman au-thority, Herod the Great (37–4 BCE) undertook an ambitious building campaign that included the construction and expansion of several private pal-acet. The overall design and layout of Herod's palace complexes, although greatly influenced by Roman engineering innovations of the time, were inspired by Hellenistic models (Roller 1998:95). Based on the archaeological and historical records, Herod's palace complexes—at Jerusalem, Caesarea, Masada, Jericho, and Herodium—include orna-mental gardens and/or parks. With the exception of the official palace at Jerusalem, all of these had monumental swimming pools (Netzer 1977, 1981). Of particular interest in relation to Petra's garden is Herod's pleasure garden at Herodium. At the base of the conical mountain fortress is a large gar-den terrace adjacent to a monumental pool (Fig. 15) with a small round island-pavilion (Netzer 1981). The overall plans of the Herodium garden/pool-complex and Petra's are virtually identical, although the Herodium complex is built on a sig-nificantly larger scale.

The long history of interaction between Nabataea and the neighboring kingdom of Judea, and the connection with Herod—his mother was Nabhatean and he spent several of his formative years in Petra—would likely have promoted a di-recct exchange of ideas and innovations between the two cultures. It is reasonable to expect that Aretas IV, who came to the throne near the end of
Hero's reign, would have sought to emulate the building program of his Judean rival, The Temple of the Winged Lions and the theater, both built at Petra during Aretas IV’s reign, have been defined as “structures of Herodian inspiration” (Roller 1998:254), and thus it is possible that the Nabataeans modeled the the pool-complex and garden at Petra would have offered a refreshing retreat from the inevitable hustle and bustle of the city’s center”

Due to poor preservation of the north wall of the catellum. A segment of pipe running southwest-northeast across the top of the pavement at the south edge of the garden appears to be another later addition to the original hydraulic system.

The pool continued in use, in some capacity, into the 4th century CE when the pavilion walls collapsed into the pool, most likely the result of the 365 CE earthquake which destroyed many monuments in Petra. The remnants of later walls, evidence for the secondary use of the hydralic installations, and a raised field that occupies part of the earthen terrace, testify to the continued use of the site for agricultural purposes through the post-Clasical occupation of Petra and into the modern era.

The Role of a Garden in Petra

During the Nabataean and Roman periods, the pool-complex and garden at Petra would have offered a refreshing retreat from the inevitable hustle and bustle of the city’s center (Fig. 16). Visitors could relax by the pool or stroll through the garden enjoying the sweet smell of flowers or possibly escape the blazing sun under a grove of shade trees. The combination of water and greenery would have created a pleasant microenvironment within the hot and arid climate of this desert metropolis. In addition, the sound of water running through the various pipes and irrigation channels would have created a musical effect. The island-pavilion offered a private refuge away from prying eyes and ears. If part of a royal complex, the island would most certainly have been a favorite sanctuary for the king and other high officials, the site of private meetings and banquets.

The Greek geographer Strabo described Petra as “having springs in abundance, both for domestic purposes and for watering gardens” (Geography VII.16.4-21). Nabataeans are known for their ingenious engineering skills: they developed a complex system of dams, channels, reservoirs, and cisterns to collect virtually every drop of water runoff in order to fulfill their domestic needs and to irrigate their fields (Hammond 1967). However, as the population grew there was an increasing demand for water, and despite their noted accomplishments, it is doubtful that the Nabataeans had enough excess water to fulfill the demands of a grandiose garden and monumental pool. But the Nabataeans wanted to establish Petra—their political, religious, and cultural center—as a prosperous and thriving metropolis within the larger Hellenized world. The presence of a large formal garden—a virtual oasis—in Petra would have delivered a powerful statement to merchants and foreign delegates passing through the city after a long journey in the harsh desert environment.

Acknowledgments

Funding for the Petra “Lower Market” Survey was provided by an ACOR Near and Middle East Research and Training Act Pre-doctoral Fellowship, a National Science Foundation Doctoral Dissertation Improvement Award, and the generous collaborative efforts of Martha Sharp Joukowsky, director of the Brown University excavations of the Great Temple at Petra. The project was carried out with the cooperation of the Department of Antiquities of the Hashemite Kingdom of Jordan. All photographs are by the author unless otherwise noted.

Bibliography


600 people) that may have functioned as a concert hall (odion) or meeting hall (boulēterion) (Joukowsky 1998:125-28). This renovation, roughly dated to the late 1st or early 2nd century CE, coincides generally with the Roman annexation of Nabataea in 106 CE, and appears to represent the transformation of the Great Temple complex into a civic center and place of public assembly. Thus, in the Roman period, the Petra pool-complex and garden became a public space, attached to the new civic center. This was in keeping with the Roman concept of the garden as an important element in both the private and public spheres. The Romans loved nature, and they loved to manipulate it and make it part of the urban environment. Thus their civic structures such as theaters, temples, markets, and the forum were often incorporated into beautifully landscaped settings embellished with elaborate waterworks (cf. Farrar 1998:175ff.).

It is likely that renovations within the pool-complex also coincide with the Roman annexation. A vaulted bridge was constructed inside the pool, connecting the East-West Wall and the north face of the island and allowing easy access to the island-pavilion through its front (northern) entrance. The bridge was constructed using a crumbly gray lime-ash mortar similar to mortar used elsewhere at Petra and in a Roman-period reservoir at the Nabataean settlement of Humeima (Eadie and Oleson 1986:57). We discovered the same lime-ash mortar on the pavilion floor, indicating that renovations were undertaken here as well. Rectangular impressions in that gray mortar are all that remain of the paving stones that once covered the pavilion’s floor (Fig. 9). Discovered mixed in with the gray mortar were several sherds of a Nabataean painted fine ware that can be dated very specifically to the beginning of the 2nd century CE (Schmid 1956:166, Abb. 701-03), supporting the hypothesis that renovations coincided with the Roman annexation.

The construction of the bridge against the East-West Wall blocked the overflow passage connecting the pool with the catellum, and the passage was sealed up with small stones and mortar. It was probably at this time that a small lead pipe was installed immediately above the floor level of the catellum, to allow water to drain from the pool. A similar replacement is seen at Humeima and may represent a new approach to water consumption influenced by the Romans, whose rules about the use of natural resources differed from those of the desert Arabs (Oleson 1995:719).

A ceramic pipeline made up of interlocking segments and held in place with mortar and stone chinking is also tentatively attributed to the Roman period. It was installed below a course of limestone molding that runs along the length of the north face of the East-West Wall. The pipe likely tapped into a water source at the catellum, but the nature of this connection is unknown.
Eadie, J.W., and J.P. Oleson

Farrar, L.

Hammond, P.C.

Joukowsky, M.S.

McKenzie, J.

Netzer, E.


Nielsen, I.

Oleson, J.P.

Parr, P.

Roller, D.W.

Schmid, S.G.

---

**Leigh-Ann Bedal** is a Ph.D. candidate in the Department of Anthropology at the University of Pennsylvania, where her research focuses on the archaeology of the ancient Near East, with a particular emphasis on complex societies, urban development, and the archaeology of empire. Bedal participated in excavations at the Assyrian centers of Nineveh (Iraq) and Til Barsip (Syria) prior to her involvement with the Great Temple excavations at Petra. She is currently completing her doctoral dissertation on the Pool-Complex in Petra and will be spending her time next year (2000–2001) as a Fellow for Studies in Landscape Architecture at Dumbarton Oaks in Washington, D.C.