

# PRELIMINARY REPORT ON THE TEMPLE OF THE WINGED LIONS CULTURAL RESOURCE MANAGEMENT INITIATIVE (2014-2019)

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## **Introduction**

The Temple of the Winged Lions (TWL) is a Nabataean temple complex dated to the 1<sup>st</sup> to the 4<sup>th</sup> centuries AD in the heart of the ancient city of Petra. Built on a promontory that rises above the north bank of the Wādī Mūsā (**Fig. 1**), the temple overlooks the colonnaded street and several important religious and public buildings. The temple and several areas abutting it were the focus of a long-term excavation project directed by Philip C. Hammond (1924-2008) between 1974 and 2005 as part of the American Expedition to Petra (AEP) (Hammond 1996). The temple building has an entrance flanked by columns and an inner cultic chamber (*cella*) with a raised podium. While most columns had Corinthian-style capitals, those surrounding the main podium had “winged lion” capitals, which give the monument its name. The walls and columns of the temple’s inner sanctum were brightly decorated with floral and figurative designs, and recesses and niches surrounded the podium. Thought to have been built by the Nabataeans in the early 1<sup>st</sup> century AD and continuing in use through the Roman annexation of 106 AD, the temple is surrounded by structures on its west and north sides, including rooms, corridors, and spaces that Hammond interpreted as workshops. In addition, farther to the north is a courtyard structure with benches known, as the north court (**Fig. 2**, northern part of plan). The earthquake of 363 AD appears to mark the final date of the temple’s use.

The Temple of the Winged Lions Cultural Resource Management (TWLCRM) Initiative was launched in 2009 as a cooperative

project undertaken by the American Center of Oriental Research (ACOR), the Department of Antiquities of Jordan (DoA), and the Petra Archaeological Park (PAP), which is within the Petra Development and Tourism Region Authority (PDTRA). The following preliminary report presents the main activities of the TWLCRM Initiative between 2014 and 2019 (Tuttle 2013a; Corbett and Ronza 2014, 2015; Corbett 2016; Corbett and Green 2017; Tuttle, Corbett, and Ronza 2017; Green 2018, 2019a)<sup>1</sup>.

Initiated by Christopher Tuttle of ACOR, the TWLCRM Initiative was developed with the intent of accomplishing multiple goals: (1) to stabilize, conserve, and protect the monumental temple and its precinct; (2) to rehabilitate the surrounding landscape that was adversely affected by the original excavation project; (3) to develop and implement a comprehensive presentation strategy for the temple and its environs; (4) to (re-)publish data derived from both the original excavation and the new project; (5) to help develop guidelines and manuals for different aspects of cultural resource management (CRM) work in the Petra Archaeological Park; and (6) to help build local capacity for undertaking CRM efforts as a means of increasing the likelihood that current and future work will become sustainable.

Work at the TWL was initially expected to finish in 2014–2015, yet with the identification of further emergency conservation and site presentation needs, and the availability of further funding, continued work was possible until

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1. See also the winter issue of each ACOR Newsletter 2009-2019: [www.acorjordan.org](http://www.acorjordan.org).



1. View of the Temple of the Winged Lions in spring 2017, following installation of the pathway and glass sign, and with the architecture in the southwest quadrant wrapped in geotextile (photo: Qais Tweissi).



2. Plan of the Temple of the Winged Lions in 2012 (surveyed by Qutaiba Dasouqi).

2018. This included completion of conservation and backfilling programs, installation of interpretative signage and pathways, and creation of a hands-on educational program. The project saw changes in management, staffing, and funding support over the past five years. In addition, there has been a focus on the preparation of archival and research materials for the TWL Publication Project, conducted largely at ACOR.

Covering the reporting period, the project directors from ACOR were Christopher Tuttle (2009 to June 2014), Glenn Corbett (June 2014 to October 2017), and Jack Green (from October 2017 onward). Elena Ronza served as a co-director until March 2017. Monther Jamhawi, former director general of the Department of Antiquities, was an associate director of the project (2014 and 2018). TWLCRM team members Eman Abdessalam and Ahmad Mowasa were employed as USAID Sustainable Cultural Heritage Through Engagement of Local Communities Project (SCHEP) site stewards and played a vital role in project delivery between 2015 and 2018. Lead conservators were Christina Danielli (2013–2014) and Franco Sciorilli (2016–2018). Giuseppe Delmonaco, engineering geologist of Institute for Environmental Protection and Research, Geological Survey of Italy (ISPRA), was a project consultant between 2014 and 2018. Allison Mickel, a doctoral candidate at Stanford University and Fulbright scholar based in Jordan in 2014-2015 (now assistant professor at Lehigh University), was the team's anthropologist from 2015 to 2018. Marco Dehner, a doctoral candidate of Humboldt University, helped document the site's *lapidarium* from 2017. Archaeologist Tali Erickson-Gini served as the project's ceramicist and archival consultant through 2015, and PAP staff members Qais Tweissi, Wajd Nawafleh, and Halemah Nawafleh, all former TWLCRM team members, provided regular support to the project throughout. The TWLCRM Initiative acknowledges contributions by Sela for Vocational Training and Protection of Cultural Heritage between November 2015 and July 2017. Sela, a non-profit organization based in Umm *Ṣayhūn*, helped develop and implement a community-based training program in site

conservation and preservation at the Temple of the Winged Lions. Qutaiba Dasouqi was the surveyor for the project until 2018; his efforts resulted in the creation of new plans and contour maps. Lastly, the TWLCRM Initiative thanks the many local community team members, interns, and trainees who worked hard on this project over several years.

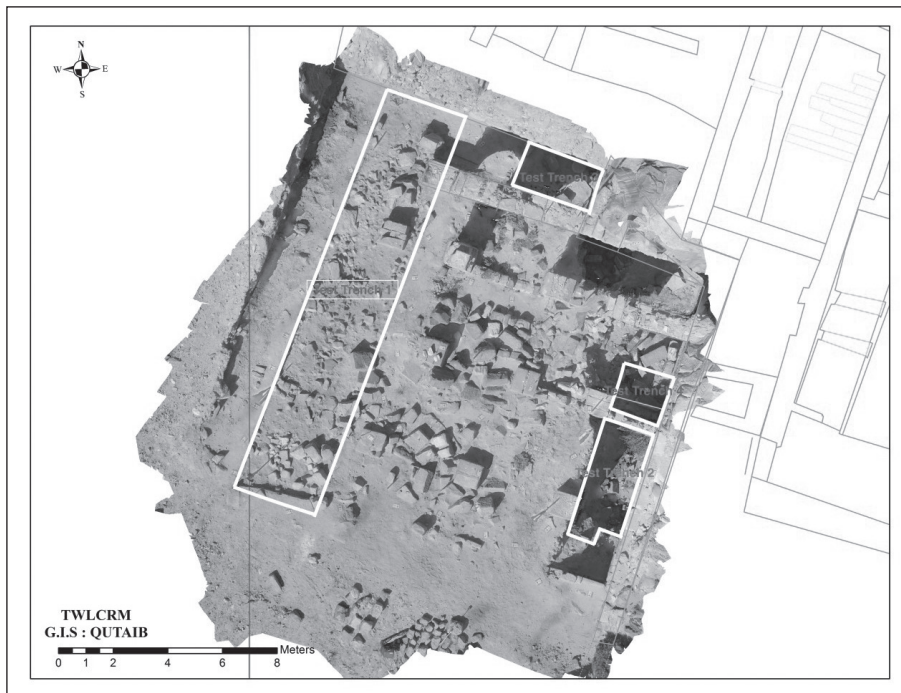
The site-based results of the TWLCRM Initiative presented in this report are spread across two major funded programs: firstly, funding from the US Ambassadors Fund for Cultural Preservation (AFCP) aimed towards conservation and site preservation needs (finalized in early 2017), and, from 2015 to 2018, a phase supported by USAID SCHEP that incorporated conservation training and culminated in the completion of emergency conservation of the *cella* and the southwest quadrant, as well as preparation of pathways and signage. Now that this important site is conserved, as well as safe and accessible for visitors, this brief preliminary report outlines the project's achievements and efforts over the past five years. The authors are grateful for all the support provided by donations, sponsorship, and grant funding, as well as in kind support from the Department of Antiquities and the PDTRA (see Acknowledgments).

### Southwest Quadrant Excavation

Overseen by TWLCRM co-director M. Elena Ronza in collaboration with Department of Antiquities representatives Ahmad Lash and Asem Asfour, four test trenches were opened in the southwest quadrant over a six-week period during October and November 2014 (**Fig. 3**). Six students from Al Hussein Bin Talal University also took part in this excavation season. Some further small excavation and cleaning in this area took place between mid-November and mid-December 2015.

Test trench 1 (16×3m) ran parallel to the southwest quadrant's western section, corresponding with AEP subareas V.9 and V.6. In test trench 1, many large architectural fragments and building stones appeared below the present surface. Fragmentary pieces of painted plaster were found among the masonry. Based on the jumbled architectural remains and the dating of the recovered pottery, it is thought that the





3. Orthorectified boom photograph of the southwest quadrant, showing locations of excavation trenches. Note the orange lines showing the location of the west wall adjacent to trenches 2 and 4 (image: Qutaiba Dasouqi).

southwest quadrant was used as a dump when the destroyed temple above was being cleared of debris following the earthquake of 363 AD.

The ceramics from these four trenches were assessed by ceramicist Tali Erickson-Gini, who found a range of vessel and lamp types dated between the 1<sup>st</sup> century BC and the 4<sup>th</sup> century AD, generally corresponding with those found in Hammond's AEP excavations. One Islamic-era glazed pottery sherd was found during cleaning.

The ashy traces of a small fire pit with remains of animal bones and eggshell were found amid the debris of trench 1. This is interpreted as the remains of a small campfire made by workers who were salvaging building materials. Given the heavy accumulation of debris, the trench was closed in order to focus on other trenches in the southwest quadrant.

Test trenches 2 and 4 (5×2m and 2×2m, respectively) were opened in the eastern part of the quadrant, directly abutting the west wall, which bounds the temple's west stairway. These areas had already been partially excavated by Hammond (AEP subareas III.4 and III.7) and by 2014 contained silt and modern debris. Test trench 3 (2.5×1.5m) was opened on the north side of the quadrant (AEP subarea III.7). Trenches 1, 3, and 4 were only partially excavated, all revealing similar architectural

debris and concentrations of painted plaster.

Only trench 2 was excavated down to natural deposits, and revealed a fuller picture of the sequence, including through its west section. Beneath the layer of heavy architectural debris encountered below the surface was a layer that had a more limited concentration of architectural debris and mostly painted plaster fragments encountered between 879.25m and 878.95m asl, mirroring the situation in trenches 1, 3, and 4. Beneath this level was a 1.2m thick general accumulation deposit containing sparse painted plaster fragments. After removing contaminated layers post-dating the AEP excavations, the excavators encountered a partially preserved coarse pavement made from irregularly shaped dry-laid stones at 877.75m asl. This coarse paving was in two layers (smaller stones overlaying larger ones) and had a compact bedding layer underneath (**Fig. 4**). Only the bedding layer, consisting of compact soil and beaten earth with small stone inclusions, was found to extend underneath the west wall (**Fig. 5**). There are indications of an ashlar block beneath the lowermost stone of the pier in the east section, which suggests that the foundations of the piers extend below the paving. A 1.0×1.0m trench within trench 2 below the bedding layer reached natural or water-laid soil. It is not clear either if the paving

over the bedding layer was truncated by the west wall and is therefore part of an earlier structure predating the temple or if the paving was simply part of the sequence of construction over the bedding layer. It appears that the lowermost course of the west wall was constructed without foundations, directly on top of the bedding layer. The foundations of the piers in the southwest quadrant were not reached. Future probes may be required to clarify the sequence, including the potential identification of phases pre-dating the temple's construction.

### Geophysical Survey

In 2014, a study of the underlying geology of the Temple of the Winged Lions was undertaken by Giuseppe Delmonaco and Luca Puzzilli of ISPRA in order to assess the stability of the site and its architectural features, including the potential impact of seismic activity in past and present eras. First employed was geoelectrical resistivity tomography, which involves deploying a series of current-injecting electrodes into the ground to measure the electrical resistance of buried features relative to the surrounding geology. Secondly, active seismic tests were conducted; in these, small seismic events were simulated, sending shockwaves directly into the earth's surface. Measuring the relative velocity of the seismic waves allows information about the depth and makeup of subsurface features to be obtained, leading to a subsurface geophysical model of the site. The sandstone bedrock underlying the temple complex was found to be much farther underground than expected –approximately 30-35m below the archaeological site (862-857m asl). A minor fault line was also detected below the east side of the temple, which is furthermore the location of some of the more unstable columns, which required strengthening. The construction of the temple over a depression between two seismic faults makes the site particularly vulnerable to earthquakes. In addition, subsurface voids below the temple may explain why the exposed architectural remains are so susceptible to accumulation of moisture and are particularly prone to salt efflorescence. A topographic monitoring system was implemented from September 2014 to November 2015 in



4. The partially preserved coarse paving in trench 2 and the pavement bedding layer beneath it. West wall in foreground on right side (photo: TWLCRM Initiative, ACOR).



5. Facing east towards the west wall in the southwest quadrant built directly on the pavement bedding layer. Note that sign refers to 'East wall,' relative to trench 2's orientation (photo: TWLCRM Initiative, ACOR).

cooperation with Qutaiba Dasouqi to control further deformation of the inclined columns located in the western corridor of the temple. The results provided minor movements due to expansion/contraction of iron-rich minerals that characterize the Petra sandstone. Such deformation has been correlated with daily temperature fluctuations in Petra recorded for the same period. A further site visit by Delmonaco and Francesco Traversa of ISPRA in 2016 allowed for additional measurements and continued assessment of the site's stability. These findings have informed the direction of conservation efforts at the site: buttressing and backfilling vulnerable areas and cautioning against attempts to reconstruct walls or columns beyond their preserved heights (Corbett and

Ronza 2014; Delmonaco *et al.* 2019).

### **Vocational Training and Site Stewards**

A key success of the TWLCRM Initiative has been derived from its focus on equal opportunities, gender-blind hiring, and vocational training aimed at providing new employment for local community members in the Petra region, in addition to sharing skills, knowledge, and experience between specialists and non-specialists. Mentorship has played an important role in the sharing of skills and best practices, as well as the development of leadership experience, project management, and stewardship skills during the course of the project. All of these skills are transferable and therefore sustainable in terms of future employment and related opportunities in archaeology and heritage preservation for local communities (see Corbett and Ronza, forthcoming; Green and Sciorilli forthcoming).

Community-based archaeology and cultural heritage preservation became an important aspect of research in its own right through project anthropologist Allison Mickel, supported by translator and interview assistant Eman Abdessalam. In 2015, Mickel documented local community team member perceptions of archaeology and heritage preservation, while experimenting with innovative recording methods aimed at capturing local knowledge and understanding.

In 2015, the non-profit organization Sela was established, receiving support through USAID SCHEP to develop a vocational training program at the Temple of the Winged Lions with a focus on long-term preservation needs in the southwest quadrant. To serve as local ambassadors for the site and the project, two site stewards were identified: Eman Abdessalam and Ahmad Mowasa, both veterans of the TWLCRM local team. The key role of site stewards was to represent the site during visits by dignitaries, schoolchildren, and tourists, while improving their own understanding of site management and preservation.

In 2016, with technical oversight by project co-director M. Elena Ronza, lead conservator Franco Sciorilli, and engineering geologist Giuseppe Delmonaco, the Sela team provided nearly 70 members of Petra's host communities

with hands-on experience in essential documentation, conservation, and backfilling techniques. Workshops and training sessions carried out within a trial period enabled the selection of team members to work at the site.

The involvement of Sela ended in July 2017. TWLCRM team members, led by the SCHEP site stewards, continued to complete major conservation and site enhancements up until April 2018. An event to celebrate the completion of the work at the Temple of the Winged Lions and to award certificates of participation took place at the end of April 2018, attended by members of the TWLCRM Initiative team, the Department of Antiquities, PDTRA, USAID SCHEP and other ACOR staff, and project specialists. This was also an opportunity to gather and share in the achievements of the project, to reflect on the work conducted to date through presentations and consultation meetings, and also to identify challenges and priority areas for the future.

TWLCRM has provided the potential for new or enhanced employment opportunities for many of those who received such training. Several team members have since gained employment in cultural resource management roles within Petra and elsewhere in Jordan. Several former TWLCRM Initiative team members have gone on to be employed with the PDTRA. Sela, the local company that emerged as a result of the TWLCRM Initiative, continues to play an active role in a range of cultural heritage projects in Jordan.

In addition to practical on-the-job conservation training, the continued documentation of the site's condition, the recording of interventions, drafting of site management guidelines (with a view toward creating future manuals), and continued monitoring have been important parts of the project. Training of team members has included the analysis of the condition of archaeological areas, documentation of architecture, monitoring of vegetation, drainage, pathways, barriers and signage, and the continued assessment of the impact of salts, which are among the activities that need to continue as part of general site management procedures by the PDTRA. As the TWLCRM Initiative shifted to more targeted, smaller-scale projects in fall 2018, there were opportunities for



on-the-job training for existing and new PD-TRA staff and local trainees, enabling former TWLCRM team members to transfer skills to their colleagues (Green 2018). By the end of the site-based operations at the close of 2018, over 300 local community members had been trained in tangible vocational skills related to heritage preservation, including documentation, conservation, excavation, and landscape rehabilitation. It is hoped that the Temple of the Winged Lions can continue to be a venue for future hands-on training activities and that this example of a community-based approach can serve as a model for other projects in Jordan and beyond.

### Conservation

Conservation needs at the TWL focused on critical needs in the temple's *cella* and the southwest quadrant, as well as backfilling at a number of locations around the site. The conservation season in spring 2014 helped resolve challenges faced within the temple's main cultic podium and the east wall of the *cella*. A team of seven conservation technicians, led by lead conservator Christina Danielli, cleaned encrusted salts from the sidewalls of the podium and the *cella*'s east wall. Where necessary, the team used a water-based stone consolidant, Syton X-30, to prevent further deterioration. The relatively poor condition of the podium sidewalls and the east wall required repairs using a reversible lime-based hydraulic mortar, which was tinted in a way to identify the intervention but minimize its visual impact. The *cella* podium surface, once covered with decorative *opus sectile*, was by this time a mass of eroding bedding mortar. The team carried out general surface cleaning and made mortar repairs to the platform's fragile edges. In 2015, under the guidance of junior conservation technician Ahmad Mowasa, several trainees removed further destructive salts and modern cement mortars from the sandstone walls of the temple and the southwest quadrant.

In 2016, efforts were continued by lead conservator Franco Sciorilli and senior assistants Baha' Jankhot, Khaled Wahkyan, and Marwan Jamaliah, who continued to clean the building's sandstones of embedded salts and applied layers of a reversible lime mortar between the ashlar

blocks that make up the temple's walls, filling deep cavities and voids (**Fig. 6**). In addition, significant cleaning and backfilling efforts were completed for the open trenches immediately in front of the *cella* (the pronaos and spaces below), providing a stable base for the creation of future pathways that would allow safe access for visitors. By November 2016, almost all of the building's front-facing architecture, including the monumental walls of the temple's entrance and forecourt, had been conserved. This new mortar was applied so that it channels rainwater gently away from the structure. In addition, vegetation was removed and, in some cases, missing or damaged stones were replaced to improve stability and cohesion.

The prevalence of salts, three leaning columns, and exposure of the podium to the elements still required emergency conservation in the *cella*, carried out from fall 2017 to early 2018. These interventions were led by Franco Sciorilli, assisted by Baha' Jankhot, Hamza Wakhyan, and Khaled Wakhyan. Solutions included the provision of a mortar capping and a magnesium panel for the podium of the temple (**Fig. 7**), which replaced a temporary wooden cover added in the 2016-2017 season. The mortar capping includes a breathable geotextile layer over a layer of bedding mortar to help prevent the buildup of moisture from the podium. A gradient of 2 degrees allows water to flow off the podium. Further backfilling of the *cella* floor with a layer of geotextile, also at a slight gradient, has helped to improve drainage of rainwater away from the site and to prevent moisture buildup in the *cella*. In the temple's west side, two leaning columns were braced



6. Conservation training in action. Mortaring of the east wall of the *cella* in 2016 (photo: USAID SCHEP, ACOR).



7. Before and after the application of a protective mortar capping on the cella podium in 2017 (photos: Franco Sciorilli).

with wooden supports; a third was partially restored with an intact column drum from the *lapidarium*. As a result of these actions, the *cella* is now safe and accessible. The impact of salts on the ashlar appears to have been reduced due to these actions, although the situation within the temple *cella* continues to be monitored.

In the southwest quadrant, conservation actions began by backfilling the previously excavated areas in 2016. Following the completion of documentation, cleaning, and mortaring, all exposed architecture was wrapped with geotextile and subsequently backfilled with alternating layers of soil and rubble. A number of the already documented ashlar blocks originating from the temple and collected during Hammond's excavations were reburied in these trenches. The backfilling of the southwest quadrant continued in 2017 and was completed in the same year. The process of backfilling was informed by the geological study of the Temple of the Winged Lions (see above), leading to the use of sandbags at the juncture between the trench and the rubble slope in a stepped arrangement (2.0×2.0m along its 10.5m east-west extent) in order to provide greater stability and prevent collapse of the rubble slope. This was followed by the addition of compacted layers of fill to form a downward gradient from the northern edge of the quadrant, providing further stability for the rubble slope and assisting the flow of rainwater. In addition, backfill was added above the slope to prevent rainwater accumulation and seepage behind it. Backfilling was also carried out in the southeast

quadrant in order to improve drainage.

Although much of soil and rubble for the project's backfilling efforts was previously generated through the clearing and sifting of the AEP's spoil heaps (Fig. 8), due to time limitations, much of the backfilling material (approximately 147 cubic meters) used in the southwest quadrant and other areas was brought onto the site from a source in Mā'an outside the Petra Archaeological Park. The fill, a fine loamy sand, was selected due to its compaction properties and lack of permeability. It is noted to have been a more yellowish color than the surrounding soil matrix. A chute was used to deliver the backfill material down the slope to the southwest quadrant below. While the arches and piers within the southwest quadrant are largely buried to protect them from collapse or damage, it was decided to leave their tops slightly above ground to allow continued



8. Landscape team members Agelah Jmeidi and Bassam Alfaqeer sifting dumped soil for backfilling in the southeast quadrant, August 5, 2017 (photo: Halemah Alnawafleh).



awareness of their presence.

In fall 2018, further consolidation was carried out on the rubble slope, which had been initially consolidated in 2017, and lime-based mortar was applied to the west wall and the upper part of a short diagonal wall between the rubble slope and the west wall. Sciorilli, Khaled Wekhyan and Marwan Al Jamaliyyah added further drainage channels to the rubble slope and, along its base, a slab-covered east-west drainage channel (Fig. 9) leading to a larger north-south channel was cut into the backfilled slope, which helped to improve the overall drainage in this area. Documentation, cleaning, and mortaring was assisted during this season by PDTRA staff members who served as on-the-job trainees.

### Documentation

In addition to the documentation carried out during the southwest quadrant excavations, architectural and conservation documentation continued to play an essential part of the TWLCRM Initiative, particularly for the creation of elevation drawings of standing walls previously excavated by the AEP. There was also a need to carefully document the condition of the exposed sandstone walls prior to conservation interventions and backfilling.

In 2014, documentation specialist Eman Abdessalam produced elevation drawings to document walls and sections within the expansive southwest and northwest quadrants, and in 2015 she mentored team members in architectural documentation and recording techniques. As the conservation and preservation work increased in 2016, so did the documentation. Eman Abdessalam and draftsman Halemah Nawafleh made “state of facts” drawings to record and detail the condition of walls and features. Hand drawings were made of all implemented conservation work that altered the appearance of the walls. Previously undocumented or partially documented areas (such as the walls of the temple’s forecourt) became a priority as the conservation team progressed in their work. Architectural documentation continued in subsequent seasons, including the north corridor wall carried out by PDTRA staff member and former TWL team member Halemah Nawafleh,

who shared skills with other on-the-job trainees in fall 2018. This leaning wall, currently supported by sandbags on its south side, was in need of assessment in anticipation of future conservation work.

The TWLCRM Initiative continued to make use of digital tools in surveying and the creation of three-dimensional models. Surveys with a total station and photo-boom documentation were conducted by project surveyor Qutaiba Dasouqi in 2012, 2016, and 2018. These have all contributed to the overall mapping of the site and surrounding landscape. In 2016, former TWLCRM draftsman and then PDTRA employee Ahmad Hasanat finalized a 3-D AutoCAD model of what the temple and its surrounding landscape might look like after the completion of backfilling operations. TWLCRM draftsman (subsequently PDTRA employee) Qais Tweissi also created 3-D visual renderings of the temple based on reconstruction drawings by Chrysanthos Kanellopoulos and others, which now support visitor interpretation (see “Landscape, Pathways, and Signage,” below).

A commitment to combining documentation, training, and research continued through efforts to fully assess and reorganize the multiple lapidaria spread across the site. The main *lapidarium* forms a square arrangement of several hundred diagnostic architectural fragments from the temple and has developed since the time of Hammond’s excavations. Following Tweissi’s work in 2014 to document a large number of individual architectural fragments within the *lapidarium*, Marco Dehner, a PhD candidate of Humboldt University, Berlin, continued efforts to more fully document this



9. Southwest quadrant, showing covered drainage channel completed in December 2018 and areas of conserved walls, facing east (photo: Jack Green).



10. Photogrammetry model of the main lapidarium at the Temple of the Winged Lions (image: Marco Dehner; using photo-documentation carried out in October 2017).

area in 2017 as part of his doctoral research. It has since become apparent that the AEP had documented and published the architectural fragments from the TWL only selectively and that further documentation and publication is needed. Documentation assistant Halemah Nawafeh continued to measure and photograph the fragments. Dehner undertook an extensive rapid photo-documentation of the *lapidarium*, which resulted in a photogrammetric model that will serve as a useful tool for documentation and preparation for future conservation and reorganization (Fig. 10).

Mapping of drainage channels was conducted by Dasouqi as part of the fall 2018 survey to document all recent conservation interventions (Fig. 11). In collaboration with Franco Sciorilli

and Giuseppe Delmonaco, the drainage study reveals the impact of natural channels on the hillside affecting the site. Among other areas of study, the *lapidarium* is shown to be particularly vulnerable to issues of drainage and is being considered for a longer-term project focused on training, documentation, conservation, and interpretation.

The documentation of artifacts continued to be an important aspect of the TWLCRM Initiative, with a focus on objects retrieved during sifting of the AEP spoil heaps, material encountered during the southwest quadrant excavations, and AEP objects in museum storage facilities. In 2014, documentation specialist Eman Abdessalam took final photographs of all recorded and publishable



11. Composite contour map of the TWL, showing locations of features and interventions carried out as part of the TWLCRM Initiative, including paths, steps, backfilled areas (pink), and the presence of drainage channels (blue). Note the perpendicular drainage channels in the southwest quadrant (surveyed by Qutaiba Dasouqi, December 2018).



pottery and artifacts recovered from the spoil heaps. On-site work continued throughout 2015 and 2016 with a focus on clearing and sifting dump 4. A few examples of unstratified objects encountered through sifting included a ceramic cup fragment depicting a Nabataean horned capital and a delicately carved face that likely once adorned the temple's interior (Corbett and Ronza 2015: 3), a miniature silver spoon (Corbett 2016: 3), lamps, and coins (Fig. 12). Abdessalam and TWLCRM intern Wiebke Lepke began re-photographing and re-registering objects recovered during the original AEP excavations housed in museum storerooms in Petra. Coins and other artifacts continued to be found during sifting operations, including during the education program. Artifacts and architectural fragments were brought back to ACOR in 'Ammān for further cleaning and documentation, contributing to the work of the TWL Publication Project (see below). This resulted in the discovery of a new stucco face that can be added to the range of those that the AEP retrieved from the temple (Fig. 13). There is a future plan to rebury much of the non-diagnostic material back at the TWL once it has been fully documented and assessed.

### Landscape, Pathways and Signage

Making the TWL site safe and accessible for visitors was a major aim of the TWLCRM Initiative. Through efforts carried out by the TWLCRM Initiative team between 2015 and 2018, several pathways were created to improve access to the site (see Figs. 1 and 11). In addition, there was continued assessment of the landscape. In summer 2015, Connor Smith of Andrews University continued the landscape vegetation field survey begun by Erin Addison in 2012. Smith was able to identify 26 plant species, a reduction from the 72 species identified during the spring and fall 2012 surveys (Corbett and Ronza 2015: 3).

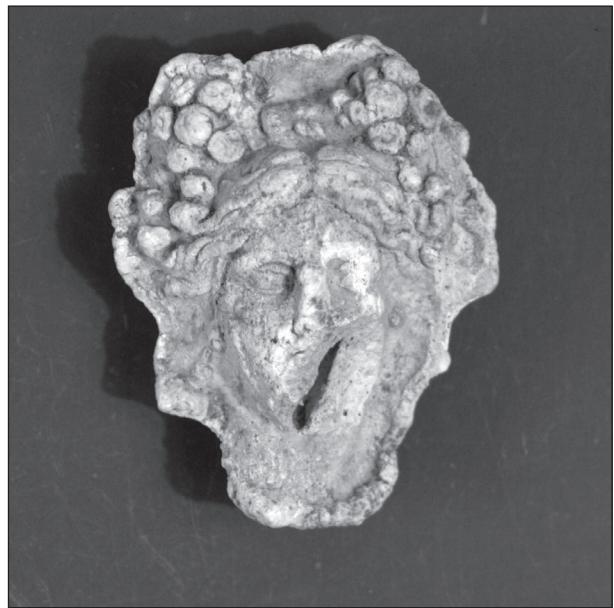
A key aspect of the creation of new pathways and improvement of the landscape has been the repurposing of previously excavated materials from the site, including sifted soils coming largely from dump 4 on the northwest side of the temple complex, as well as stone ashlar that cannot be used for future reconstruction taken from the lapidaria to line the paths. It is

noted that the large volume of the spoil heaps around the site, combined with the necessary labor required to sift this material to make it available for conservation purposes, has meant that only a portion of the spoil heaps was drawn upon in the project period. Due to the continued value of the AEP spoil heaps, and the fact that they still contain many artifacts, it is advised that they be conserved for future educational and preservation projects.

Two types of pathways were created. Firstly, a pathway was built around the east wall and in front of the temple's *cella*; this consisted of successive layers of sandbags filled with clean sifted soil from the AEP spoil heaps, which were then covered with a layer of large limestone chips, followed by a layer of geotextile and a layer of clean earth fill. Over this was deposited



12. Copper-alloy coin (obverse and reverse) found during cleaning of the southwest quadrant, May 2014 (image: TWLCRM Initiative, ACOR).



13. Stucco head depicting either Ariadne or a maenad (identified by R. Wenning). Found in dump 2 in 2012, documented at ACOR in 2019. H. 5.3cm (photo: J. Green/TWLCRM Initiative, ACOR).



a layer of reddish-brown coarse sand to match the color of the site. The pathway first completed in 2016 was widened in early 2018 to allow space for more visitors.

The second type of simple ashlar-lined compacted-earth pathways, graded in some instances, were installed around the site between 2015 and 2018 by the TWLCRM team. Unfortunately, severe rains in spring 2018 led to channeling and erosion within some completed sections of the pathways, which the PDTRA quickly repaired. A drainage study of the site in fall 2018 suggested a need for additional drainage channels and modification to steeper pathway sections. Visitors surveyed in fall 2019 did not report significant problems with the pathways and generally found the site to be accessible. The condition of the paths remains under review. In addition to pathways, fixed posts and portable post-and-rope barriers were added at key points to prevent visitors from climbing over vulnerable or hazardous parts of the site.

Signage was an important outcome of the project (Green 2019a). An augmented reality (AR) glass sign at TWL, inspired by an example at the Heidendor at Roman Carnuntum in Austria, was developed by M. Elena Ronza, Qais Tweissi, and Jehad Haron and produced by the Modern Advertising Center signage company in ‘Ammān. The sign was installed in 2017 as a follow-up to a 2013 pilot project to partially restore the temple with faux column capitals (Tuttle 2013b). The glass sign presents a visualization of the inner sanctum of the TWL along with imagery of a winged-lion column capital (Fig. 14). This provides visitors with a way to interpret the architectural space as an interplay between past and present, allowing them to see what is preserved and what was once present.

In spring 2018, a series of new signs was installed to mark the end of our main program of site improvements. This included a second glass sign down on the colonnaded street, some distance from the site at a lower level, allowing visitors to see the two-story temple dramatically emerging from the hillside and thus further building awareness of the TWL among those passing through the colonnaded street of Petra. The first glass sign in the *cella*

sadly suffered damage, but it was subsequently replaced thanks to AFCP support. The second glass sign in the street was also damaged in November 2019. The glass signs can be viewed as a pilot project, and future applications will depend on the durability of such signage.

For the standard site signage, the chosen design consists of a painted steel base with a single leg and frame that supports a lightweight label holder. The graphic panel (*ca.* 70×40cm) takes the form of a reverse-printed sticker on a clear acrylic cover mounted onto the frame at each corner. This simple design allows for inexpensive reprints in the future, which will perhaps be necessary every few years due to sun exposure. The six bilingual graphic panels present introductory information on points around the site, including the fallen columns, the southwest quadrant, the northern complex, and the architectural gallery (*lapidarium*). A three-dimensional test replica of a winged-lion fragment was created to be installed in the



14. The augmented-reality glass sign installed at the entrance of the *cella* in 2017, designed to show the upper story of the temple (photo: Qais Tweissi).

*lapidarium* but was not of suitable quality for installation. In addition, supporting images were added to most signs to help visitors visualize the site. The fallen-columns panel allows visitors to relate the line of huge sandstone column drums on the ground in front of them with a reconstruction drawing showing the façade of the temple as it would have appeared in antiquity. In the southwest quadrant, a panel is positioned to allow visualization of the supporting arches in this partially backfilled area, as well as to indicate the role that local community members played in preserving the site. The southwest quadrant was cordoned off to discourage visitors from climbing over conserved areas. In addition, simple wayfinding and warning signs have been created, encouraging visitors to stay on paths and not to climb on the remains, particularly on the conserved temple podium.

A visitor survey and tracking project took place in October 2019 at the Temple of the Winged Lions in partnership with the PDTRA and the Petra College of Tourism and Archaeology at Al-Hussein Bin Talal University (HBTU) and with support from the DoA (Green 2019b). Four students and two PDTRA staff members conducted interviews and tracked visitors over a two-week period. Dr. Mukhles Al-Ababnah of HBTU conducted an analysis of the survey of visitors and tour guides. This will be used to help improve the visitor experience by documenting perceptions and use of the site following recent interventions. We are grateful for the support of Dr. Zeyad as-Salameen of Petra College and Ibrahim Farajat of the PDTRA.

### **Educational Programs and Outreach**

A number of educational visits were hosted at the Temple of the Winged Lions. For example, in 2015, students from the American Community School in ‘Ammān visited the project in Petra and took part in a range of hands-on archaeological and conservation activities (Corbett and Ronza 2015: 2). Lessons learned during such visits helped to develop and design a hands-on experiential learning program at the Temple of the Winged Lions. The educational awareness program developed as “Experience Petra” was subsequently renamed “Experience Archaeology.” TWLCRM team members

played a vital role in sharing the message of site conservation and preservation through such activities. The program was supported by US-AID SCHEP, the PDTRA, and Jordan’s Ministry of Education. Site stewards Eman Abdesalam and Ahmed Mowasa hosted nearly 300 Jordanian schoolchildren in fall 2017 (Fig. 15). Boys and girls from eight different schools came from throughout Jordan, including Ayla, Bayt Rās, Buṣayrah, Ghawr Aṣ Sāfi, Mādabā, Bīr Madhkūr, Wādī Mūsā, Umm Al Jimāl, and Wādī Ramm. They made the trip to TWL to learn about the temple and to participate in hands-on activities, including sifting for archaeological objects, making architectural drawings, undertaking architectural conservation, and learning about pottery. These students, aged 10–17, left with new appreciation of the temple and the preservation of archaeological sites in Jordan encouraging them to become future stewards of their cultural heritage. The pilot program was broadened to include groups of international tourists visiting Petra, demonstrating that this can be a viable future program for engaging visitors, generating revenue, and employing local communities.

In addition, public outreach efforts were



15. Umm Al Jimāl girls’ school visit to the TWL October 4, 2017 (photo: Ahmad Mowasa/ TWLCRM Initiative, ACOR).

undertaken in 2019 to help raise greater awareness of the achievements of the TWLCRM Initiative. A well-attended Temple of the Winged Lions Study Day at Petra College in Wādī Mūsā took place in July 2019. Hosted at Petra College, Al Hussein Bin Talal University in Wādī Mūsā, the event was co-chaired by Jack Green of ACOR and Ibrahim Farajat of the PDTRA. Barbara Porter of ACOR, Ali Al-Khayyat of the DoA, and Zeyad as-Salameen of Petra College gave introductory remarks. Jack Green, Franco Sciorilli, Marco Dehner, Hussein Khirfan and Raneen Naimi, Pauline Piraud-Fournet and Safa' Joudeh, and Halemah Nawafleh and Taher Falahat gave presentations. Presentations were also given for tour guides in Wādī Mūsā and for the Jordan Tour Guides Association in 'Ammān.

### Publication Preparations

With the completion of the American Expedition to Petra's fieldwork in 2005, and with only preliminary reports and two of Philip C. Hammond's final volumes published at the time of his death in 2008, significant elements from the Temple of the Winged Lions remain inaccessible to researchers. Following the physical transfer of the Philip C. Hammond/AEP Archive to ACOR in 'Ammān in 2009 by his widow, Lin Hammond, considerable efforts have been undertaken to digitize and organize the archive, as well as to process artifacts and site documentation from the TWLCRM Initiative to prepare a final publication. These include digitization efforts made between 2012 and 2015 by Christopher Tuttle and Tali Erickson-Gini, who carried out a study of the AEP's area I excavations of Nabataean dwellings immediately adjacent to the Temple of the Winged Lions (Erickson-Gini and Tuttle 2017).

Preparations toward the final publication of the Temple of the Winged Lions are supported in part by ACOR's Publication Fund, leading to the contributions of TWL Publication Fellow Pauline Piraud-Fournet (2018-2019). Piraud-Fournet has prepared a full bibliographical survey of the Temple of the Winged Lions and a thorough reassessment of the AEP excavations and its history of excavations, based on publications, unpublished

reports, and archival materials (Green 2019c).

TWL Publication Project intern Safa' Joudeh (2018–2019), assisted by ACOR intern Libby Trowbridge (Joudeh and Trowbridge 2019), as well as Nora Al-Omari, who joined in December 2019, have helped to document hundreds of fragmentary objects and materials sifted from spoil heaps between 2012 to 2018 and to digitize and organize the physical objects and archives. In summer 2019, ACOR intern Tamara Dissi documented conserved AEP and TWLCRM metal objects. By the end of 2019, 65 crates of sifted and excavated material had been processed (an estimated 50 percent of the total materials). An ongoing assessment of artifacts and a study of the temple's architecture are helping to develop a fuller understanding of religious and daily life activities, alongside the history of excavations and conservation of the site. The TWL Publication Project has also benefitted from the addition of scanned images from the Kenneth W. Russell Collection as part of the ACOR Photo Archive project and the donation of images by former AEP team member Benjamin Unger. Future priorities include the preparation of an object database based on the AEP registers and individual chapters from specialist contributors.

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