

JORDAN

Petra

In 1985 the ancient town of Petra with its almost 4000 individual heritage sites was declared a World Heritage site. Petra is particularly famous for its hundreds of façades cut from the bedrock. The other sites are caves without projecting façades, so-called sanctuaries, sacrificial sites and altars, inscriptions and votive tablets, stairs and streets, statues and reliefs as well as temples, houses and villas. From around 400 BC to the 4th century the rock town of Petra in the south of Jordan was the capital of the Nabataeans and had up to 30–40.000 inhabitants. With the end of their territorial independence the Nabataeans also lost their economic and political influence so that Petra became increasingly unimportant in the course of the 4th century.

Today, the rock-cut architectural heritage, as well as the buildings erected of ashlar masonry, are at risk because of weathering, decay, insufficient care and lack of conservation.¹ There are three main causes for the weathering and destruction:

- collapse due to static cracks, gaps and crevasses and falling loose fragments,
- erosion caused by uncontrolled rainwater drainage and floods,
- weathering from salt contamination.

Ashlar Stone Buildings

Especially at risk are the buildings made of stone masonry. Many of the ruins from the Neolithic, Nabataean, Roman and Byzantine periods threaten to collapse. These ruins were perfectly preserved in the sandy soil of the desert, but after their rediscovery via excavation they were left to their fate and are now increasingly deteriorating. Many of the sites and buildings excavated in Petra in the past decades are now in a critical state. This applies for instance to the main temple Qasr al-Bint, the Winged Lions Temple, the excavated remains above Zipp Fir'awn, the fortifications on the al Habis Medieval, Jabal al Madhbah and Al Wu'ayra, north-east of Petra, as well as to the great number of dam walls and rock-carved cisterns. Remains of buildings in the centre of the town, such as the ruins of the so-called Royal Palace, the Nymphaeum, the 'Roman House' and the Small Temple all require urgent conservation.

Apart from these buildings, there are also certain sections of the rock-cut façades which were made of ashlar masonry. According to recent investigations, 14% of all structural elements of these façades are either completely or partly made of cut stone.² In most cases these areas are seriously at risk of falling off. Not only is the natural stone severely weathered, but also the remains of the once rich decoration. During a survey of 211 tomb façades, traces of plaster, colour and stucco could be found on nearly 24% of these façades. Apart from the once coloured and plainly stuccoed rock façades the few remains of the original lavish stucco decoration at Qasr al-Bint and the finely stuccoed back walls of caves on the eastern wall of el-Habis also show signs of gradual loss.

The rock-cut façades

The rock massif of Cambrian sandstone is affected by alveolar and tafoni weathering. Holes and hollows of a few centimetres up to several metres are characteristic of this form of weathering, which

in Petra is caused by salt weathering. The damaging salt is rock salt (NaCl), which is a mineral component found in the rock.

There are serious floods every February and March caused by heavy seasonal rainfall rushing through the narrow wadis. This must be considered as the greatest threat to the heritage sites.³ Water diffuses through the normally coarse-porous sandstone and dissolves part of the salt inside the stone. This leads to salt deposits on the stone surface and to damage. As a result, almost all experts agree that the main problem for the heritage sites is uncontrolled rainwater runoff.⁴

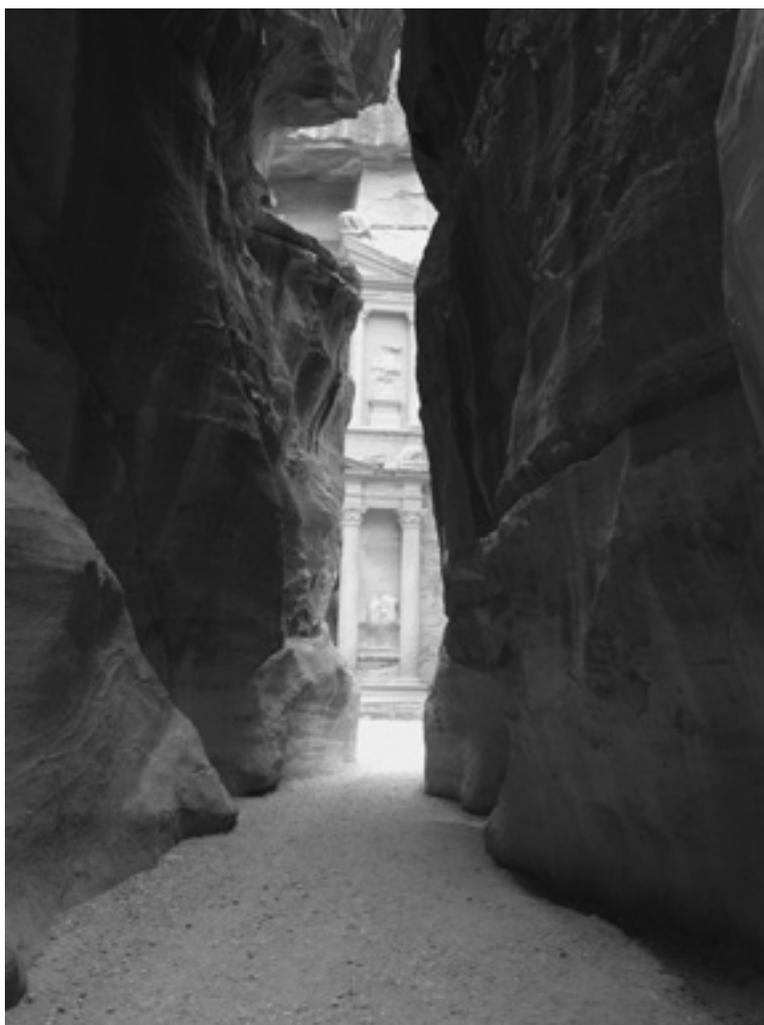
The builders of Petra, the Nabataeans, were very aware of the destructive force of the water. For this reason the majority of structures were equipped with drainage systems. Nowadays, most of them have either filled up or are partly destroyed, which in many places leads to damage to the façades.⁵

Recent examinations on 14 sites of the so-called King's Wall show that the degree of weathering is on average about 50%. About 30% of all rock-cut facades are threatened by tectonic cracks and clefts.

Incorrect restoration and shortcomings

In the last 30 years extensive restoration was carried out on Qasr al-Bint and on the Temenos gate. In all these processes, mortar

Al-Khazna at the end of the Siq





Palace Tomb, left corner

containing cement was used. This very hard and dense building material leads to an acceleration of the weathering processes of the original material and has resulted in further damage. Until now, there is no stone workshop for the large number of decorative elements, such as ornamented and partly stuccoed and painted capitals, friezes and waste fragments. Many of these pieces remain largely unprotected against weathering.

Outlook

Taking into account the large quantity of tasks, the number of heritage sites, and the size of the entire complex, effective protection is extremely difficult. In order to achieve a lasting conservation management of Petra a joint effort by an association of counties is necessary. This is why a German-Jordan project established a conservation and restoration centre in Petra (CARCIP) between 1993 and 2002. Undertaken as part of this project were a model restoration of the 14 Tombs site (Monument 825), a number of emergency stabilisations on buildings and façades and the conservation of Tomb No 826.

Apart from CARCIP's restoration work, various other teams of archaeologists are involved in restoration projects. In 2000, the altar construction of Qasr al-Bint was restored with the help of UNESCO. Currently, a casing is being erected for the wall paintings of the excavated villa on Ed-Zantur hill and the paintings are being conserved.

A strategy needs to be developed for the future which takes account of the conditions, competence and available capacities in order to achieve a lasting protection of the monuments in Petra.

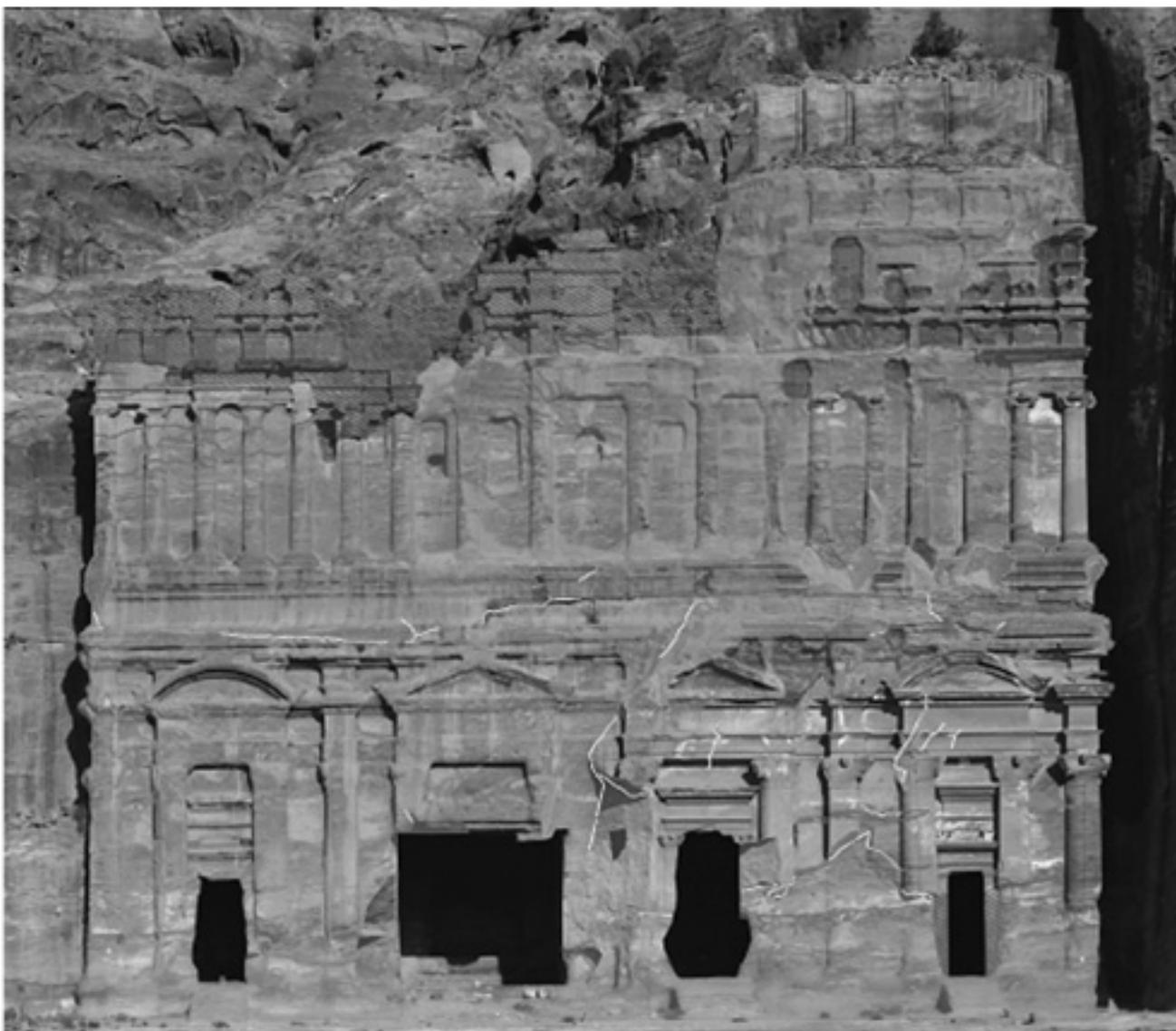
Wanja Wedekind

¹ D Bumbaru, S Burke, M Petzet, M Truscott, and J Ziesemer 2000, Jor-

Palace Tomb 765, measurement results ►



Palace Tomb: Elements, which have been masoned, not cut from the rock



measurement results

| | |
|-------------------------------------------------------------------------------------|------------------------------------|
|  | 85,5% conserved shape |
|  | 53,3 % weathering rate |
|  | 47,4 % weathering |
|  | 2,5 % alveolar / tafoni weathering |
|  | 116,9 m weathered limonit |
|  | 57,7 m cracks |
|  | 3,5 % broken area |
|  | 7,7 % stonewalled part |

| | |
|--------------------------|---------------------|
| monument type : | Roman temple tomb |
| date of erection : | first century AD |
| monument location : | G5 |
| monument name : | Palace tomb |
| monument orientation : | 297° |
| façade size (h,w) : | 47,5 x 43,9 m |
| tomb room size (h,w,d) : | 5,3 x 8,2 x 7,7 m |
| | 8,9 x 7,8 x 12,2 m |
| | 8,5 x 9,3 x 8,8 m |
| | 5,6 x 12,4 x 14,9 m |

notes : first room sealing unfinished

- dan – Heritage @ Risk!, in *Heritage at Risk, ICOMOS World Report 2000 on Monuments and Sites in Danger*, München, pp. 123–124.
- ² Ein Pflege- und Konservierungsplan der antiken Entwässerungssysteme zum Schutz der Felsfassaden in Petra, Jordanien, Diplomarbeit, Hochschule für angewandte Wissenschaft und Kunst Hildesheim/Holz- münden/Göttingen 2003, p. 66.
- ³ Lane; Bousquet 1994, *Petra National Park Management Plan*, Main Report, UNESCO Paris, p. 111.
- ⁴ This applies to the 'Petra Archaeological Park Operating Plan' (2000, p. 4), the 'Petra National Park Management Plan, Main Report' for UNESCO by Barry Lane and Bernard Bousquet (1994, p. 111 und p. 116) after Kühnenthal, Fischer, Petra. Die Restaurierung der Grabfas- saden (ICOMOS - Hefte des Deutschen Nationalkomitees XXXIV), München 2000, pp. 71–74.
- ⁵ B Fitzner and K Heinrichs 1994, Damage diagnosis at monuments carved from bedrocks in Petra, Jordan, in: *The conservation of monuments in the Mediterranean Basin, Stone and monuments: methodolo- gies for the analyses of weathering and conservation*, Proceedings of the 3rd International Symposium Venice, 22–25 June 1994 (Scientific editors: V Fassina, H Ott, F Zezza), Venice 1994, p. 670.



Corinthian Tomb, verdure



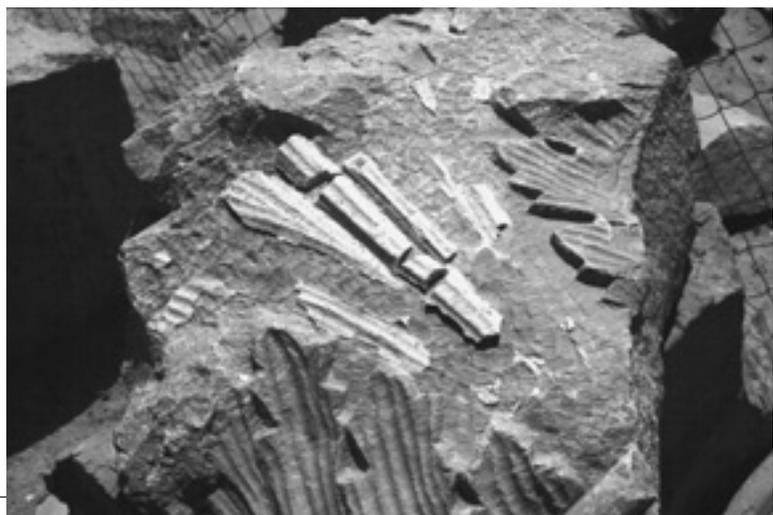
Corinthian Tomb, drainage

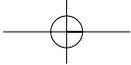


Tomb 824, endangered architectural elements

Weathered stucco decoration from the capital of the Great Temple

Wadi Mousa, wall remains

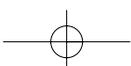


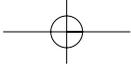


Tombs 649 and 650



Tombs 779-803





Qasr al Bint, condition of stucco decoration



King's Palace, masoned corner

Temenos Gate, cement mortar

Qasr al Bint, recent rupture on stucco decoration

