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MADĪNAT AL-ZAHRĀ', SPAIN

Conservation and Investigation of an Iron Gate



Research carried out between September 2020 and March 2021

Madrid Department of the German Archaeological Institute

by Alejandro Ugolini Sánchez-Barroso



e-FORSCHUNGSBERICHTE DES DAI 2023 · Faszikel 2

2019 wurden in Madīnat al-Zahrā', einer islamischen Planhauptstadt in der Nähe von Córdoba (Spanien), Eisenteile eines Tores entdeckt. Die Metallobjekte wurden anschließend gereinigt, restauriert und dokumentiert. Die archäologischen Überreste bieten eine einzigartige Gelegenheit, die konstruktiven Details eines Tors aus dem frühen 11. Jahrhundert n. Chr. zu untersuchen.

In 2019, iron elements of a gate were discovered at Madīnat al-Zahrā', an Islamic purpose-built capital city near Córdoba (Spain). The metal objects have subsequently been cleaned, restored and documented. The archaeological remains provide a unique opportunity to study the constructive details of a gate dating to the early 11th century CE.

Cooperation partner: Conjunto Arqueológico de Madinat al-Zahra.

Head of project: F. Arnold, A. Montejo Córdoba (2019), A. Vallejo Triano (since 2020).

Team: A. Ugolini Sánchez-Barroso, M. Muñoz Mora, W. Jablonska.

Introduction

1 A joint project of the Conjunto de [Madīnat al-Zahrā'](#)¹ and the German Archaeological Institute, co-directed by Felix Arnold and Antonio Vallejo Triano,



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1 General view of the remains of the door at the site. (Photo: D-DAI-MAD-ARN-DG-29-2019-0696, Felix Arnold)

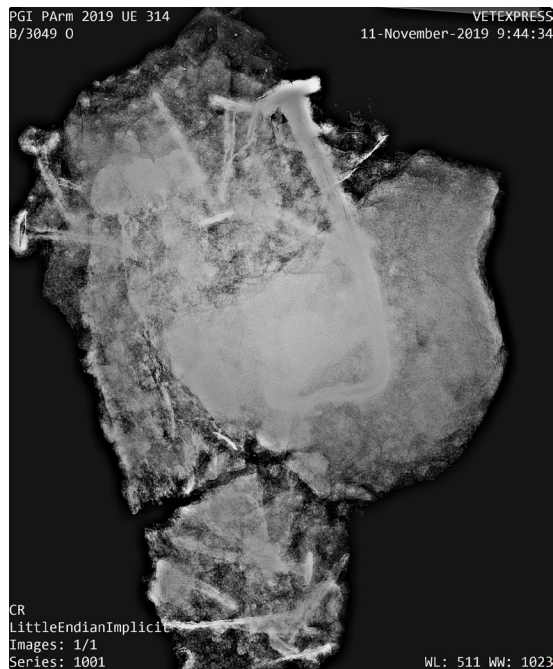
2 Micro-excavation of a segment of the door. (Photo: Alejandro Ugolini Sánchez-Barroso)

is aimed at the investigation of the forecourt of the palatial complex of Madīnat al-Zahrā', a purpose-built capital founded by the caliph Abd al-Rahman III in 936. In 2019 a gate was discovered on the eastern side of the monumental courtyard [1]. Initially the gate had served as the entrance to a building complex located to the east of the courtyard, but in its later stages it may also have functioned as an entrance to the courtyard. The gate was destroyed by a fire, probably as a result of the pillage of the city at the onset of a civil war (*fitna*) in 1010 CE [2]. Within the destruction debris iron elements of at least different door leaves were found, along with a large number of nails from the roof structure of the adjoining portico. Inside the gate itself several rivets were found. They probably had served to fix the wooden boards of one of the door leaves of the gate itself. Directly outside the gate, the remains of a second door leaf were found, completely covered by iron bands (Fig. 1). This second door leaf may originate from a neighboring gate, which remains unexcavated. The remains of this second door is the subject of this present preliminary report.

2 The remains of the door were recovered as a block, divided into several segments, and transported to the restoration workshop of the museum of Madīnat al-Zahrā'. In total four large segments were recovered, each more than 1 m² large, as well as nine smaller segments. The team of restorers at the museum developed a plan for the integral conservation of the recovered material, calling for a micro-excavation, followed by a consolidation and restoration [3]. The design and objectives set out in this document were tested in a short trial phase, followed by an extended campaign in 2020 and 2021 in which the archaeological excavation process of all the blocks was completed (Fig. 2). Throughout the process, the archaeologists worked closely with the conservation team to ensure that the iron remains, which were highly susceptible to corrosion and had been affected by the intense heat of the fire, suffered as little damage as possible.

Methodology

3 The first step in dealing with the remains of the door was the identification and orientation of each segment in the general orthophotography of the



3



4

3 Detail of an X-RAY with nails and metal bands. (X-Ray image: Eduardo M. Hernández Robles)

4 Architectonical element with marks of fire and iron. (Photo: Alejandro Ugolini Sánchez-Barroso)

excavation so that each of the materials deposited in the museum would have a clear correlation in order to be able to venture a reconstruction of the structure of the door and the archaeological processes it had undergone.

4 Since all the materials came from a level of destruction and fire, the next phase of work consisted of determining the state of conservation and consistency of the remains. To this end, diagnostic radiography was used to determine the degree of metallisation of the iron for restoration treatments, as well as the location of possible nails and other elements inside each segment (Fig. 3).

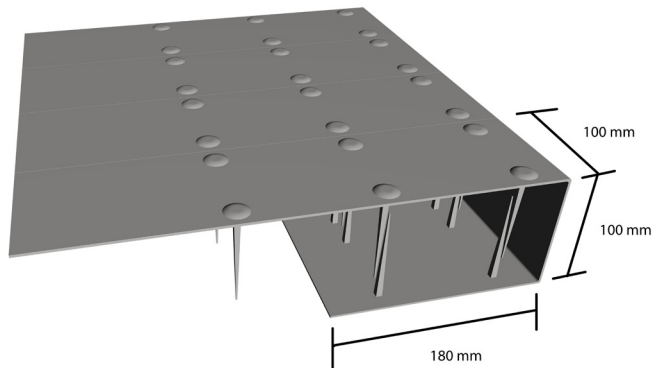
5 It was then decided to approach each segment individually and to determine its stratigraphic sequence independently in order to correlate all the information later and determine the relationships. In this way, the work process allowed rapid progress without losing scientific information. All blocks of the door contained a large number of fragments from the destruction debris, including large stones from the collapse of the architectural structures above the gate (Fig. 4), mixed with remnants of plaster and charcoal from the burning of the door leaves and the ceiling of the *portico*. The abundant amount of iron from the bands covering the outer surface of the door leaf made frontal access to the relative stratigraphy difficult, so it was determined that the best way to approach the archaeological excavation was to physically invert each of the pieces to access them from below.

6 In order to document the evolution during the main phases of the micro-excavation, 3D models of each segment were made to follow the different phases, as well as orthophotos, to study in detail elements difficult to see with the naked eye (Fig. 5).

7 The excavation process was carried out with metal tools, typical of dentists, in order to work with precision and to remove the loosest remains of the collapse, with minimal damage to the metal surfaces. However, some segments were covered with a mixture of cement-like consistency due to the action of meteorological agents and the large accumulation of lime and mortar remains from the façade of the *portico*, making it necessary to resort to more powerful mechanical tools. In these cases, a rotary tool with abrasive heads was used, as well as a small hammer and chisel, often used in



5

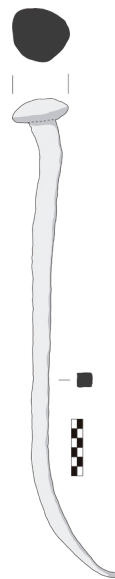


6

5 Documentation of the work progress in 3D. (3D model: Alejandro Ugolini Sánchez-Barroso)

6 Schematic reconstruction of the iron bands covering the door leaf. (Graphic: Alejandro Ugolini Sánchez-Barroso)

7 Iron nail, 40 cm long. (Drawing: Alejandro Ugolini Sánchez-Barroso)



7

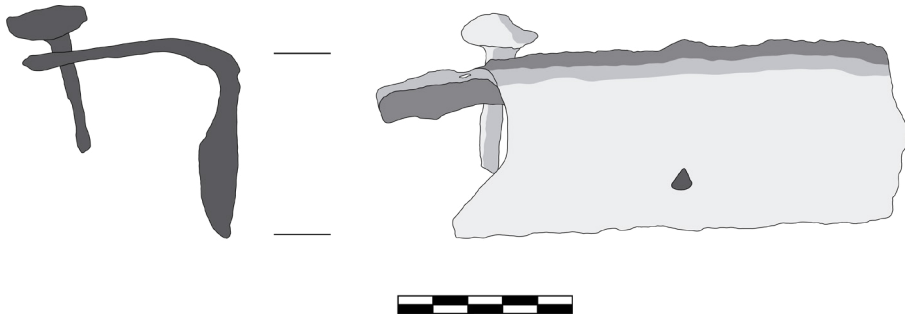
restoration work, to remove the most cemented parts as smoothly and precisely as possible.

Micro-Stratigraphy

- 8 The stratigraphic sequence is consistent in most segments of the door. It is possible to identify a uniform level of iron bands that form the surface of the door and that were the reason for the inverted excavation of the different blocks. At this level there were iron bands between 9.5 and 11 cm wide and 2 mm thick, with a length that encompassed the entire preserved width of the door. These bands were attached to the missing wooden structure of the door with iron nails, each 8 cm long with flat heads, placed in two parallel rows at regular intervals of about 11 cm (Fig. 6).
- 9 Below the level of metal bands and nails and belonging to the same phase, a level of concentrated charcoal was identified in some areas. In all cases, the carbonised organic matter was found in association with mortar and roof tile fragments but always below the main level of iron, generating in some areas the hard and dark cement referred to above. In no case was a level of fire identified on the surface of the iron, although it presented some deformations and alterations probably due to the combustion of the wood of its structure.
- 10 This level is followed by a level containing broken roof tiles originating from the fire and collapse of the roof construction of the portico [4]. Within this debris, many small fragments of plaster were found, painted in red, white and black, bent iron nails, each about 35–40 cm in length (Fig. 7), as well as fragments of calcarenite blocks, some deposited on top of the iron bands. In one case, a large fragment of ashlar was found on top of the remains of the door.

Interpretation

- 11 The excavation of the door elements has provided detailed information on its morphology. The surface of the door had been covered by parallel iron bands that were 10 cm wide and 2 mm thick, except at the lower end, where the corresponding band was bent longitudinally at 90° to cover the bottom



8 Fragment of a metal band bent at a 90° angle to covered the bottom of the door leaf.
(Drawing: Alejandro Ugolini Sánchez-Barroso)

side of the door leaf (Fig. 8). Unfortunately, it was not possible to identify the basic elements of the door mechanism, such as the locking elements or the axis on which the door had been mounted for its correct rotation. Nevertheless, we can use similar examples from elsewhere to interpret its possible original appearance. The internal structure of the door was made of wood, as evidenced by the remains of charcoal, with a frame composed of wooden beams, as has been the case for large doors since at least Roman times [5]. The cavities of this frame were covered with a wooden board on which the iron bands was applied.

12 In the historical sources, we find references to the systematic plundering to which the gates of Madīnat al-Zahrā' were subjected [6]. The texts mention more than 15,000 door leaves covered with iron and copper bands, of which we have very little archaeological evidence [7]. Four examples of a similar date and structure are still preserved in the Mosque-Cathedral of Córdoba, however (Fig. 9). Two door leaves are exhibited today in the *maq̄sura* of the mosque, but are said to originate from the passage leading from the mosque to the Alcazar of Córdoba via a passage, the *sabat* [8]. They are covered with horizontal bands of brass (an alloy of copper and zinc), 14 cm wide. The two other door leaves are covered by iron bands and may originate from the outer doors of the mosque (Fig. 9). This example confirm that the doors rotated on pivots fixed in holes in the threshold and the lintel [9]. The doors could be locked at approximately half their height by means of bolts made of iron. Gates of similar characteristics are depicted in some contemporary artworks, including the ivories of San Millán de la Cogolla [10] and the Beatus manuscripts of the 10th and 11th centuries [11]. Other examples of similar doors are of later date, including those of the Puerta de la Justicia in [Alhambra](#)[↗] (Granada, Spain), dated to 1348 [12]. A gate covered with iron bands has recently been reconstructed in [Cairo](#)[↗] (Egypt), at the Bab al-Zuwayla dating to the Fatimid period (1092) [13].

13 The physical analysis of several metal samples from the same stratigraphic levels to which the door belongs has yielded high levels of tin (Sn). Although the number of samples is limited, the implications for the finish of the iron bands of the door and probably many elements made of the same



9 Door leaves of the 10th century covered by brass bands at the Mosque-Cathedral of Córdoba (Spain). (Photo: Alejandro Ugolini Sánchez-Barroso)

metal that have been recovered at the site are very relevant. The widespread use of tin plating as a technique to protect against corrosion and provide a more durable finish to the iron is attested at the Alhambra [14].

Conclusions

- 14 It is difficult to determine the total size of the door leaf extracted in 2019 and excavated in subsequent years. Nevertheless, the excavation and restoration work that has been carried out has provided us with the remains of a unique doorway in an archaeological context that undoubtedly belongs to the chronology of the site where it was found, i. e. the early 11th century. The stratigraphy of the door fragments has also allowed us to better understand the destruction suffered by the eastern portico of the Plaza de Armas of Madīnat al-Zahrā' after the abandonment of the city, confirming the conclusions reached previously. In addition, although the door has not preserved any decoration, its function as an armoured door indicates a defensive function that we can assume was related to the control of access to the adjacent courtyard and the image that was intended to be conveyed to those who passed through it. The possibility of studying archaeological materials belonging to a closed context is an opportunity to understand in detail elements that shared a physical, ideological and aesthetic space with the architecture that surrounded them.

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[9] Torres Balbás 1956.

[10] Nieto Viguera 2009.

[11] Beatus 1991.

[12] Fernández-Puertas 1980, 168.

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