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The Stratigraphic Sequence of the Parsa Paradise Gate at Tol-e Ajori

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Abstract

The discovered ancient monument at the site of Tol-e Ajori, located approximately three km northwest of Persepolis, was identified through thirteen seasons of excavation as a gate building similar to the Ishtar gate of Babylon, based on the discovered palaeographic evidence and its architectural function. The stratigraphy of the monument reveals the following phases: the pre-construction phase (Phase 0), construction of the monument (Phase 1), the abandonment of the monument (Phase 2), secondary occupation (Phase 3), human and natural-induced destruction, including an earthquake (Phase 4), the robbery of the building's bricks during the Middle Islamic period, specifically in the Seljuk (Phase 5), and Muzaffarid periods (Phase 6). Absolute dating of five bone samples from Tol-e Ajori—yielding low-confidence radiocarbon results for the Iranian Iron Age (800–400 BCE)—suggests caution in accepting quantitative studies. The relative dating of the gate's construction, the palaeographic characteristics of the thirteen inscribed bricks, which correspond not to the Elamite and Babylonian scripts employed in the Achaemenid royal inscriptions of Darius I and his successors, but rather to the sign forms of the Neo-Elamite and Neo-Babylonian periods, the glazed bricks from Tol-e Ajori, which are technically more archaic than those from Susa or Persepolis, and the building's probable function as a replica of the Ishtar Gate of Babylon, all suggest that the monument should most likely be dated to the reign of Cyrus the Great and associated with the conquest of Babylon in 539 BCE. Accordingly, all the evidence strongly suggests that the Tol-e Ajori gateway was founded before the construction of Persepolis by Darius I, most likely within the period between 539 and 518 BCE.

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1. Introduction

Tol-e Ajori is an archaeological site in Bagh-e Firuzi, approximately 3 km northwest of Persepolis (Figs. 1–2). Its reported UTM coordinates are 39 R 068 16 41 / UTM 33 13 37.0. The mound measures approximately 30×40 m and rises 3 meters above the surrounding terrain. It lies within the first-degree buffer zone of Persepolis and was entered on Iran's National Heritage List on 7 June 2006 (registration no. 15530).

Excavations conducted between 2011 and 2023 by the joint Iranian–Italian archaeological mission under the "From Palace to Town" project have substantially expanded our understanding of the early settlement at Parsa. The discovery of Babylonian and Elamite cuneiform inscriptions, together with architectural evidence, led to the identification of the structure as a monumental gate. Despite extensive damage to the site, stratigraphic excavation and systematic classification of the finds have made it possible to reconstruct the building's history. Architectural recording and analysis of construction techniques have also informed reconstructions of the building and its decorative motifs. Three-dimensional modelling has contributed to the interpretation of the monumental gate at Bagh-e Firuzi. Following the conquest of Babylon, early Achaemenid rulers adopted elements of Babylonian religious iconography. The mušḫuššu, associated with the god Marduk, features prominently in the gate's decoration. In the Cyrus Cylinder, Cyrus attributed his conquest of Babylon and the legitimacy of his rule there to Marduk. The Tol-e Ajori gate appears to have drawn on the design of Babylon's Ishtar Gate (ca. 580 BCE), on a larger scale, and to predate the construction of the Persepolis terrace (Askari Chaverdi *et al.,* 2017). Its construction may have commemorated Cyrus's conquest of Babylon in 539 BCE. Building on reports from the six excavation seasons conducted between 2011 and 2017, this article presents the stratigraphic results of excavations at Tol-e Ajori through 2023.



Fig. 1: The archaeological site of Tol-e Ajori 2010 (photo by Authors); (Joint Iranian & Italian team).

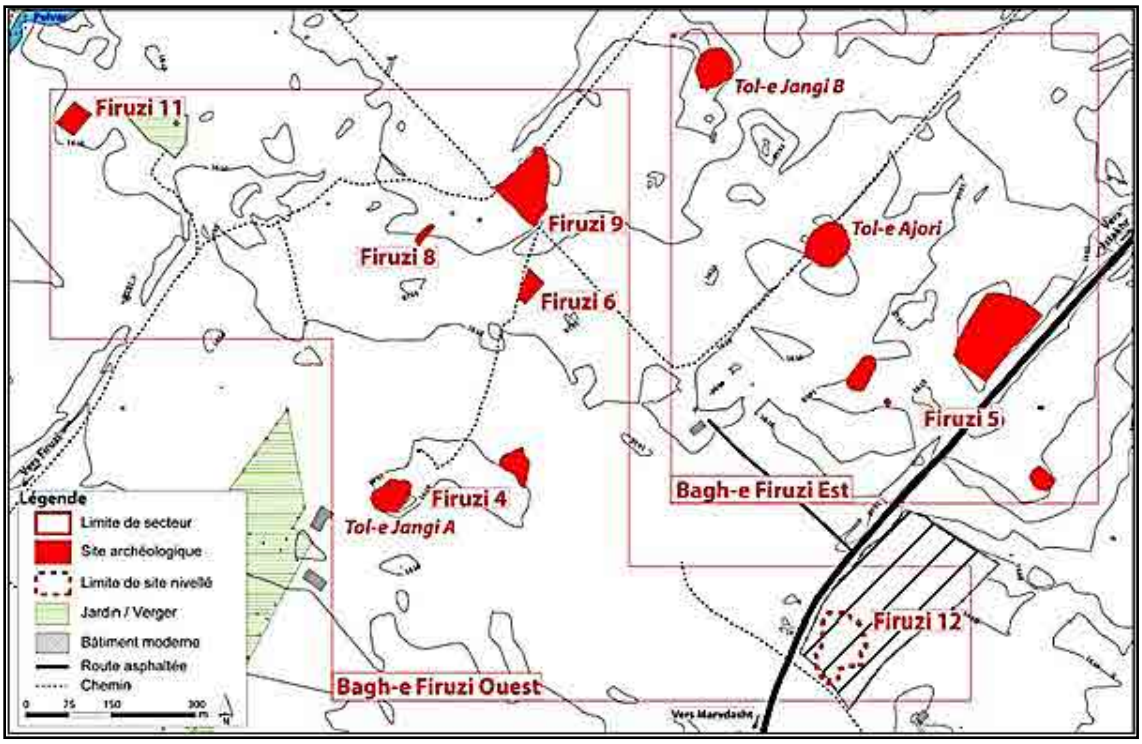


Fig. 2: Location of the Tol-e Ajori site in the Firuzi sector of Parsa (Plan: S. Gondet); (Joint Iranian, Italian team)

2. Methodology

No inscription naming a ruler has yet been recovered that would establish the monument's date securely. The complex depositional history therefore makes stratigraphic analysis essential. Systematic excavation and the construction of Harris matrices for individual trenches allowed the team to distinguish episodes of construction, abandonment, reuse, destruction, and subsequent brick robbing. Although this approach required slower excavation, it provided a basis for reconstructing the sequence of events.

A Harris matrix was prepared for each trench, recording stratigraphic relationships and the sequence of deposits and cuts. The trench sequences were then correlated to establish a site-wide chronology. This synthesis, rather than the order in which deposits were excavated, provides the basis for the relative sequence discussed here. Correlations among 29 trenches support the proposed phasing (Fig. 5).

3. Phases

The sequence comprises a pre-construction phase (Phase 0), construction of the gate (Phase I), abandonment (Phase II), localized reoccupation (Phase III), structural destruction attributed in part to an earthquake (Phase IV), and two episodes of extensive brick robbing during the medieval Islamic period (Phases V and VI; Fig. 5).

3-1. Pre-construction phase (0)

The earliest stratigraphic evidence concerns the ground surface before construction (Figs. 3 and 6). Excavations in 2014 identified limited evidence of earlier human activity in Trench 10 (Askari

Chaverdi *et al.,* 2017). In 2015, Trench 11 was excavated below the floor of the central room to investigate the pre-construction deposits. Sophie Cornu, a soil specialist associated with the Pre-Persepolis project, identified predominantly clay-rich deposits. The two lower layers retained recognizable soil structure, whereas the upper layers were heavily compacted and lacked visible soil structure (Figs. 3 and 6). A sherd resembling Shogha pottery was recovered from a pit cut into natural deposits beneath the original floor in the southeastern corner of the central room (Trench 10; Fig. 6; Askari Chaverdi *et al.,* 2017). Excavation below the construction horizon was limited in Trenches 6, 9, 10, and 11; most of these exposures yielded sterile natural clay. Similar compact, yellowish clay was encountered outside the building, including in Trench 12.

3-2. Phase I: The construction of the gate

The building is oriented northwest-southeast but deviates by approximately 20 degrees from the east-west axis (Fig. 4). This structure measures 29.06 meters (northeast-southwest) by 39.07 meters (northwest-southeast) and consists of a thick wall with a width of 10.47 meters. The internal room is 10.12 meters wide and 14.20 meters long, while each of the corridors is 4.56 meters wide and 7.42 meters long. Additionally, the lateral projections (towers) are 8.83 meters wide and 5.00 meters long. Two fence-like mud-brick walls, each 1.20 meters wide, were constructed at the southeastern and southwestern corners, with 4 meters of the length of the southeastern wall still visible (Figs. 4, 10, 11). Due to destruction, only mud-brick sediments remain from the southwestern wall. These two walls enclosed the eastern and western facades of the gateway on the southern side (Fig. 11).

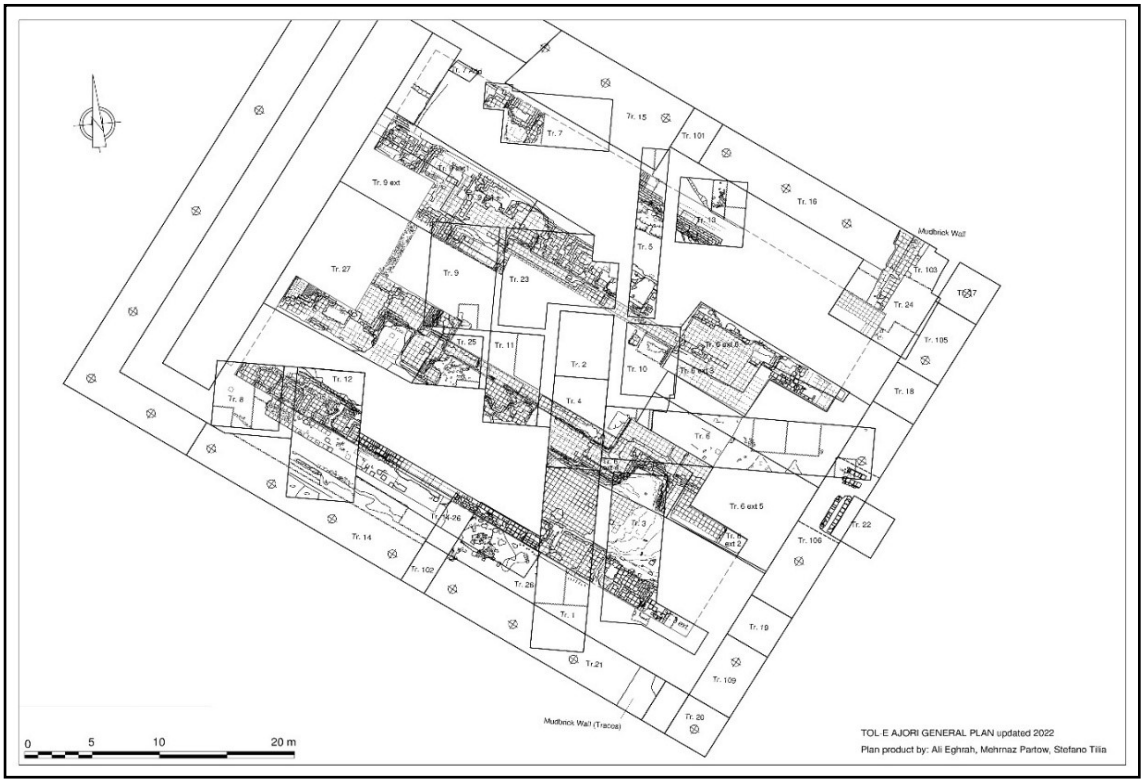


Fig. 3: Plan of the excavation trenches at Tol-e Ajori. 2024: Main construction phase of the building and periods of temporary occupation (drawing: Stefano Tilia, Mehrnaz Partow, Ali Egra'); (Joint Iranian & Italian team).

The structure was built of fired brick and mudbrick (Fig. 7). Its plan resembles the southern section of Babylon's Ishtar Gate, and its bricks follow a comparable module, measuring approximately 33 cm on each side (Askari Chaverdi and Callieri 2025).

Glazed bricks covered the wall façades. Geometric and floral patterns decorated the lower courses, while fragments recovered from the collapse deposits suggest that the walls also carried panels depicting bulls and the composite creature known as the mušḫuššu (Figs. 12–13). The reconstructed decorative scheme consists of a blue ground with lotus flowers, geometric patterns, and animal figures. These motifs evoke Mesopotamian royal and religious imagery, particularly the iconography associated with Marduk (Fig. 12). The gate is interpreted as an entrance to a royal garden or paradeisos associated with the substantial building at Firuzi 5 (Fig. 14).

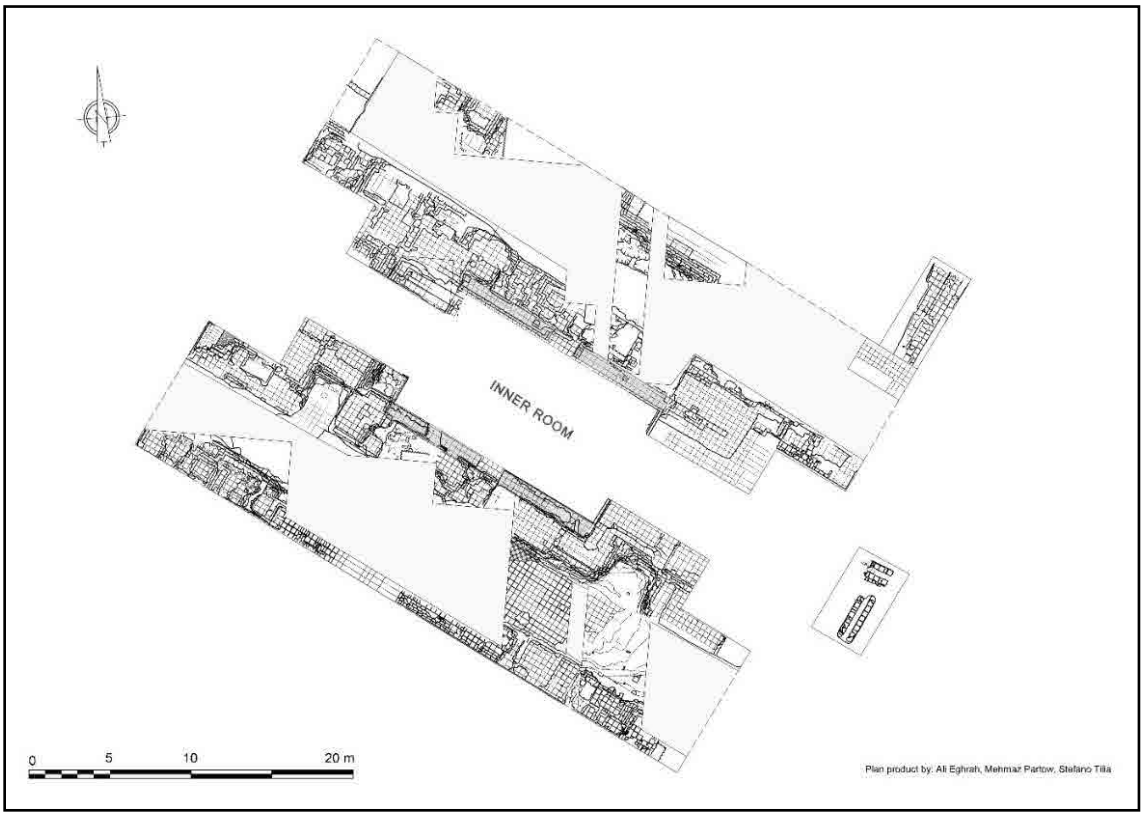


Fig. 4: Plan of Phase I: Main construction phase of the Gate building, 2024 (drawing: Stefano Tilia, Mehrnaz Partow, Ali Egra'); (Joint Iranian & Italian team).

3-3. Phase II: The abandonment of the building

The excavations provide evidence for the abandonment and subsequent reuse of the gate. Conditions differ between the central room (Trenches 6, 9, 10, and 11; Figs. 3, 6, and 15) and the exterior areas (Trenches 1, 3, 8, 12, and 13; Fig. 3), particularly where later robber trenches disturbed the deposits. In the room and corridors, the earliest post-use deposits consist of accumulated sediment and evidence of animal burrowing. Their character varies among trenches (Figs. 6 and 15).

3-4. Phase III: The occupational phase

Occupation deposits overlying the Phase II sediments occur in the central room, corridors, and surrounding areas. During Phase III, occupants levelled parts of the accumulated sediment and adapted the gate for domestic and other activities. Mudbrick walls blocked the northwestern and southeastern passages. Hearths and installations indicate cooking and other activities in the corridors, while channels supplied or directed water around the structure. Some channels may also have served nearby fields or livestock, although these functions remain uncertain. The building had ceased to function as a monumental gate and was being used for local habitation. Comparable reuse of nearby structures is possible but has not been demonstrated. The subsequent destruction of the gate is discussed under Phase IV (Figs. 16–21 and 29–33).

Occupational phase	Occupational/cultural phase		Archaeological evidence
Phase VI	Final Phase		Creamy-buff pottery with combed/wavy patterns. Round-headed metal rods similar to Islamic-era samples from Fars. Two rusted coins from Middle to Late Islamic centuries
	VIe	Topsoil	
	VId	Horizontal pits dug like tunnels (treasure hunting).	
	VIc	Renewed pits from building looting	
	VIb	Accumulation/Sedimentation.	
	VIa	Third phase of temporary habitation	
Phase V	Continuous looting of the gate's bricks		Buff-colored potsherds with combed patterns and wavy incised decorations (5th to 7th centuries AH).
	Vc	Pits filled with fine clay and silt; gradual sedimentation	
	Vb	Large pits contain traces of limited temporary habitation (Second transient occupation	Moulded pottery fragments attributed to the 4th and 5th centuries AH (Islamic Period
	Va	Digging pits to extract and loot bricks	Numerous pits from successive looting of the gate's bricks
Phase IV	Earthquake		Destruction of the building and extensive accumulation of debris.
Phase III	Reuse of the building for habitation; eventual abandonment (Occupation).		Simple reddish potsherds from the 6th to 1st centuries BC scattered in the sediments. Three-winged Achaemenid arrowheads and a metal rod.
Phase II (abandonment of the building)	The gate is abandoned due to disuse		The building is deserted; fine clay and silt sediments gradually accumulate on the corridor floors
Phase I	Construction of the gate		Similarity to Babylon's Ishtar Gate in design, plan, motifs, colors
	Ib	Addition of two mud-brick walls in the SE and SW corners	Similar to the mud-brick fortifications connected to the Ishtar Gate in Babylon
	Ia	Construction of the gate building (29.06 x 39.07 m) in a NW-SE orientation	Cyrus the Great conquers Babylon in 539 BC
Pre-Construction	A limited number of potsherds scattered on the surface before the gate's construction		Pottery similar to inverted-rim vessels, painted black on a red background of Shogha type

Fig. 5: The main occupation and construction phase, abandonment and collapse of the gate, together with the temporary occupation phases (Joint Iranian & Italian team).

A: Documentation within the Interior Spaces of the Building: Inner Room and Corridors

Two mud-brick walls identified within the boundaries of Trench 6 (at the entrance of the southeastern corridor) and Trenches 9 and 27 (at the entrance of the northwestern corridor) clearly indicate that the objective of constructing these walls was to utilize the interior space of the gate (Figs. 3, 17, 18). The mud-brick wall at the southeastern entrance is constructed of mud-brick and rammed clay, though its composition also incorporates scattered bricks looted from the original structure (Fig. 18). Similarly, the northwestern entrance wall was built with greater precision, featuring two outer rows of broken bricks and brick fragments in the center, likely serving as the wall's foundation, while the main body consisted of mud-brick and rammed earth (Fig. 17). The most prominent evidence of occupation during this phase was discovered in Trench 10: a furnace located in front of a looted bench. This furnace utilized four bricks for its base, with additional bricks lining the margins to define its sides and was constructed parallel to the walls of the main room. A series of post-holes were excavated around the furnace and in the corner of the room, suggesting the presence of a canopy or shelter (Figs. 3, 6). Ash recovered from this furnace had been dispersed in subsequent accumulations and contained both bone fragments and pottery. Additionally, a high-quality pestle made of polished black stone was recovered (Fig. 29). This phase represents the primary evidence of secondary occupation within the ruined structure. Soil accumulations containing several worked stone fragments from statues/Figures, as well as scattered potsherds lying flat on the occupational surface across the interior hall, along with ash and bone, indicate habitation in the interior section during the third phase (Fig. 16).

During this same phase, the northwestern entrance (Trench 27) and the southeastern entrance (Trench 6) were also inhabited (Figs. 3, 17, 18). The presence of the clay remains of a circular oven, 50 cm in diameter and 30 cm deep, at the northwestern entrance (Fig. 20), along with a jar situated on a platform made of rammed earth (Figs. 19, 20, 33), and the remains of a water channel (of which only a few bricks from the base and perimeter remain in the central part of this entrance; Fig. 26), demonstrates that the northwestern entrance was fully occupied during the third phase (Fig. 17). Correspondingly, numerous cooking furnaces accompanied by ash at the southeastern entrance, particularly the remains of a water channel where the surrounding and floor bricks are well-preserved in the central section (Fig. 3), all indicate that the southeastern entrance of the gate was extensively inhabited during the third phase (Fig. 18).

B: Documentation of the Building's Surroundings: Peripheral Spaces around the Exterior

During this third phase, the residential settlement was not confined to the interior of the central room and the northwestern and southeastern corridors; rather, the entire exterior lateral facades and the surrounding areas of the building were utilized for habitation. The structural similarity between the arrangement of broken bricks in the northwestern corridor (Figs. 3, 17) and the brickwork structures in Trenches 8, 12, and 26 on the western side of the building indicates that all these constructions were carried out during Phase III (Fig. 3). The buttress adjacent to the western wall of the building in Trenches 8, 12, and 26 suggests that it was likely constructed to support Phase III

habitation and was associated with activities occurring around the building (see: Askari Chaverdi & Callieri 2025: Fig. 25). During this phase, the peripheries of both the eastern and western exterior facades of the gate were occupied, and occupational remains were recovered from all these areas (Fig. 21). Furthermore, the remains of several bricks found at the entrance of the northwestern corridor (Trench 27; Fig. 14) and the southeastern entrance of the gate (Trench 22; Fig. 3) may be related to water channels and water management for the inhabitants' use, as well as for directing water toward agricultural fields (Figs. 3, 14), (see: Askari Chaverdi & Callieri 2025: Fig. 32).

In addition to occupational remains such as bones and broken potsherds found throughout the building's perimeter, 26 trilobate bronze and iron arrowheads (Fig. 32) and 17 clay sling bullets (Fig. 30) were recovered from the surrounding area and the two northwestern and southeastern entrances. This indicates that defensive measures were taken to protect the inhabitants during this phase. Moreover, a significant number of carved stone fragments, including parts of the face, jaw, mouth, and paws of broken stone lions, were recovered from this phase, specifically from trenches around the building (Trenches 1 and 3) and inside it (Trench 10). All these gray and white marble fragments belonged to the Phase III context (Fig. 31). Additionally, a vast quantity of broken orange and red Achaemenid pottery fragments was recovered from this phase, consisting primarily of bowls, jars, and plates characteristic of this period.2

3-5. Phase IV: Structural Destruction, Massive Rubble Accumulation, and Earthquake

In Trench 23, the eastern brick wall exhibits displacement and a fissure 10–15 cm wide extending for approximately 5 m (Figs. 22–24). The deformation suggests a sudden structural event, possibly an earthquake. Similar damage was recorded in the opposing western wall. Substantial accumulations of collapsed brickwork were documented in the central room and corridors (Fig. 25).

On the interior face of the western wall, the decorated outer masonry had shifted downward by approximately one brick course and outward by as much as 13 cm (Fig. 25). The displacement deformed the façade, although the lowest course of glazed bricks remained largely in place.

Above deposits associated with abandonment, excavation revealed damaged masonry and extensive accumulations of brick and mudbrick debris (Fig. 25). In Trench 9, glazed bricks in the southwestern corridor wall were fractured, and the wall had buckled near its junction with the central room, although displacement was less pronounced than in Trench 11. A compact deposit containing small glazed and unglazed brick fragments underlay more substantial collapse deposits. These observations are consistent with major structural failure, but the precise sequence and cause of destruction require further investigation.

3-6. Phases V and VI: Short-term Settlement Phases

The fired bricks of the original structure were extensively removed for reuse during Phases V and VI. Robbing concentrated on the brick façades of the eastern and western walls, often leaving their mudbrick cores in place. The resulting linear robber trenches trace the original wall alignments and helped establish the building's plan (Fig. 26). Ceramic evidence suggests repeated episodes



Fig. 6: The interior floor level of the gate structure; four cut locations in trenches 6, 9, 10, and 11 for identifying the zero soil surface prior to construction (Joint Iranian & Italian team).



Fig. 7: Phase I: Construction of the western wall of the gate, the brick section in both interior and exterior views; the mudbrick core of the wall and architectural features of the use of bricks in horizontal and vertical rows (Joint Iranian & Italian team).

of removal between the fourth and eighth centuries AH, interspersed with temporary occupation of parts of the ruins (Fig. 27).

3-7. Phase V: The Extensive Pillage

The most extensive brick robbing appears to have occurred while substantial portions of the gate remained standing. Robbers removed successive courses from the façades, cutting into the masonry to recover bricks (Fig. 26). The material may have been reused in buildings near Parsa. Mold-made pottery recovered from the robber pits resembles ceramics from Istakhr dated to the fourth and fifth centuries AH (tenth and eleventh centuries CE). Other finds indicate that brick removal continued into the sixth and seventh centuries AH (Fig. 5).



Fig. 8: Phase I: Architectural structures of Phase 1; Trench 9, foundation of the northeastern tower, Tol-e Ajori 2022 (Joint Iranian & Italian team).

3-8. Phase VI

Horizontal pits cut into the rubble indicate renewed brick robbing during Phase VI. Corroded copper coins attributed to the eighth and ninth centuries AH were recovered from pit fills and upper deposits (Fig. 27). Irregular surfaces and small cleared spaces suggest intermittent, possibly seasonal occupation among the ruins. No substantial occupation is documented after this phase.

4. Chronology

Many buildings in the Bagh-e Firuzi area appear to belong to a phase distinct from the construction of the Persepolis terrace. Their individual dates must therefore be established before the settlement model proposed by Sumner for Parsa/Matezziš can be evaluated.



Fig. 9: Extension trenches 4, 5, and 6 from Trench 6, the large southeastern and southwestern towers of the building. Tol-e Ajori. 2021 (Joint Iranian & Italian team).



Fig. 10: Phase I: The mudbrick enclosure wall of the gate in the lateral section of the eastern wall (Joint Iranian & Italian team).



Fig. 11: Phase I: Reconstructed wall (fortification) of the eastern and western sections of the gate (Drawing: Bardia Shirvani); (Joint Iranian & Italian team).

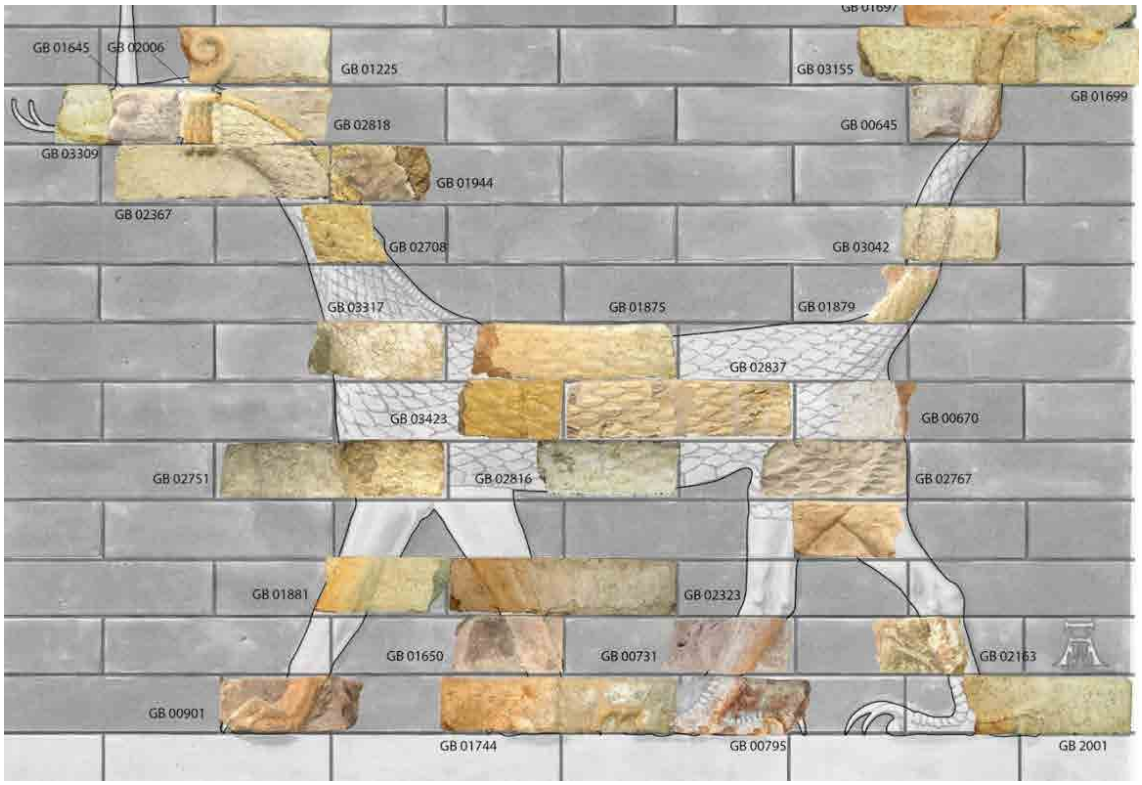


Fig. 12: The reconstructed mušḫuššu panels were created by placing several glazed bricks from Tol-e Ajori into the design of the Ishtar Gate panels (by Eris Arlotti); (Joint Iranian & Italian team).

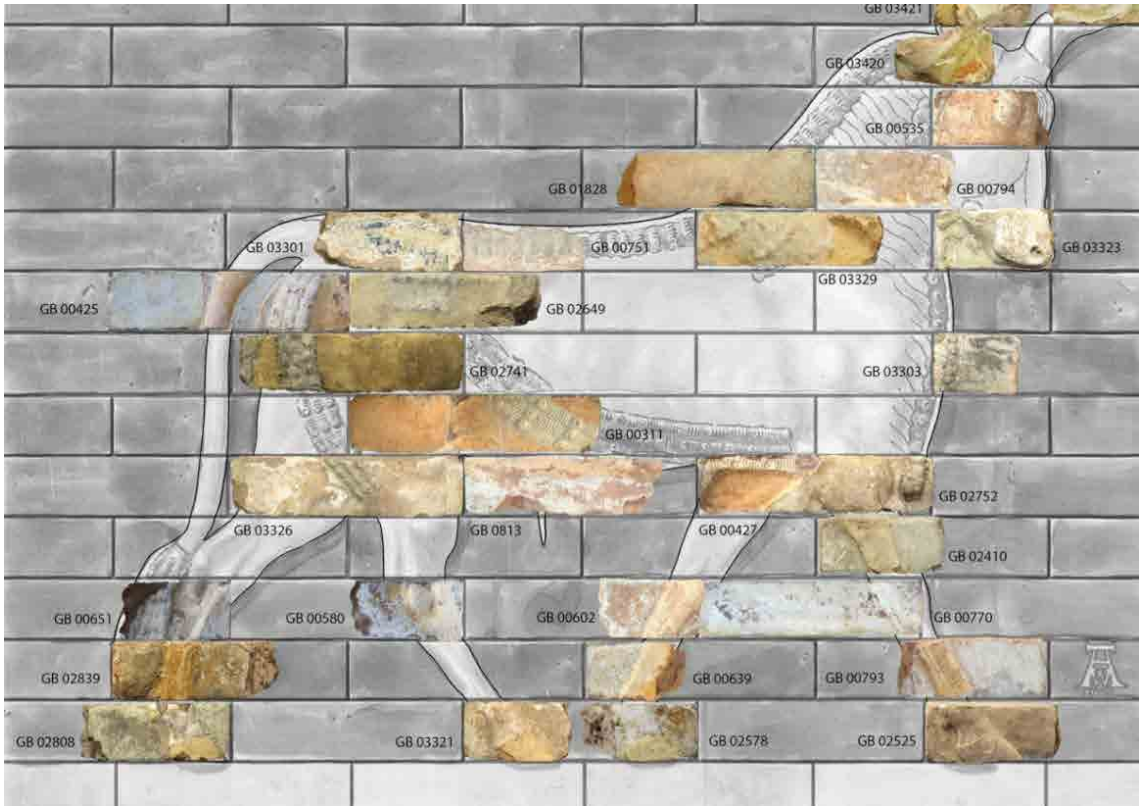


Fig. 13: The reconstructed bull panels were created by placing several glazed bricks from Tol-e Ajori into the design of the Ishtar Gate panels (by Eris Arlotti); (Joint Iranian & Italian team).

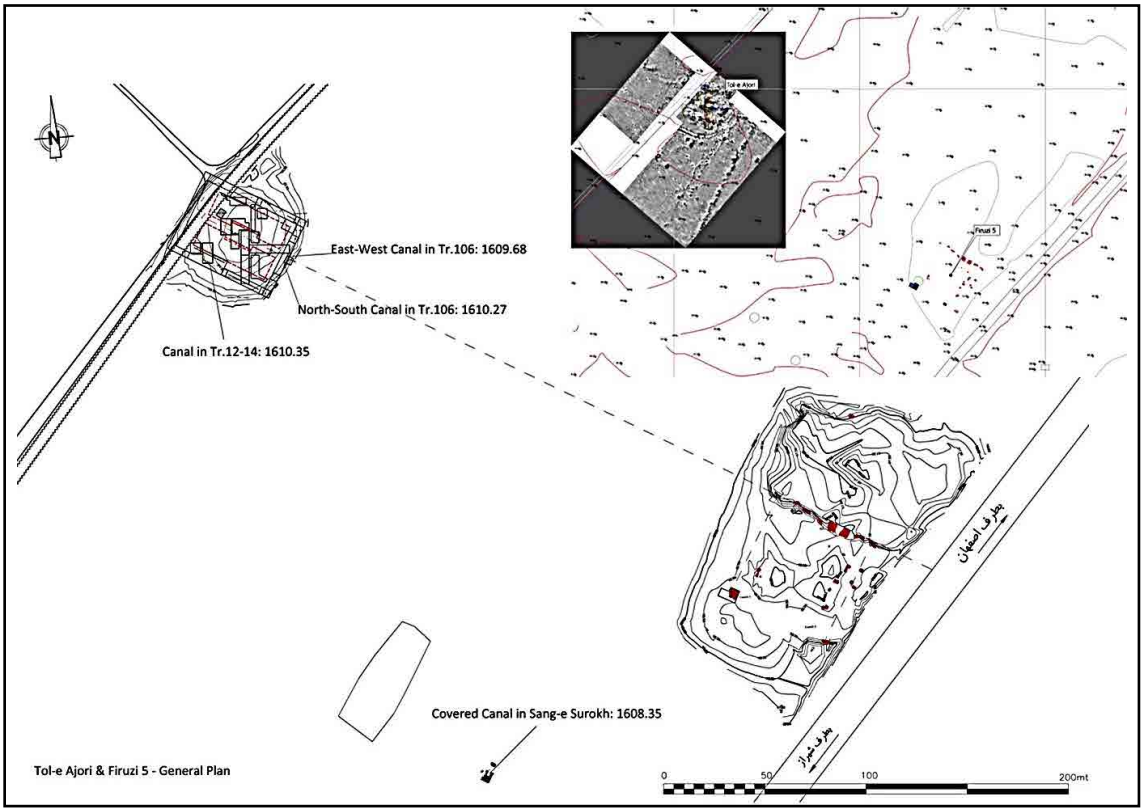


Fig. 14: The gate building opened onto the palace located in the Firuzi 5 site (Map: Stefano Tilia); (Joint Iranian & Italian team).



Fig. 15: Phase 2; naturally deposited sediment spread across the floor of the central room and the corridors due to building cracks; Trench 11(Joint Iranian & Italian team).



Fig. 16: Phase 3: occupational surface over the Phase Two deposited sediment; Trench 11; (Joint Iranian & Italian team).



Fig. 17: Phase 3, temporary occupation and closure of the northwest entrance of the gate with a mudbrick wall and broken brick foundation; Trench 9; (Joint Iranian & Italian team).



Fig. 18: Phase 3; temporary occupation and closure of the southeast entrance of the gate with a mudbrick wall and occupational surface; Trench 6; (Joint Iranian & Italian team).



Fig. 19: Phase 3: northern portico of the building and jar-shaped vessels from the third phase; Trench 27, Tol-e Ajori; (Joint Iranian & Italian team).



Fig. 20: Phase 3: kiln with a flue wall from Phase Three at the northwest entrance of the gate; Trench 27, Tol-e Ajori; (Joint Iranian & Italian team).



Fig. 21: Phase 3: occupational traces on the outer edge of the eastern wall of the gate; Trench 16, Tol-e Ajori; (Joint Iranian & Italian team).

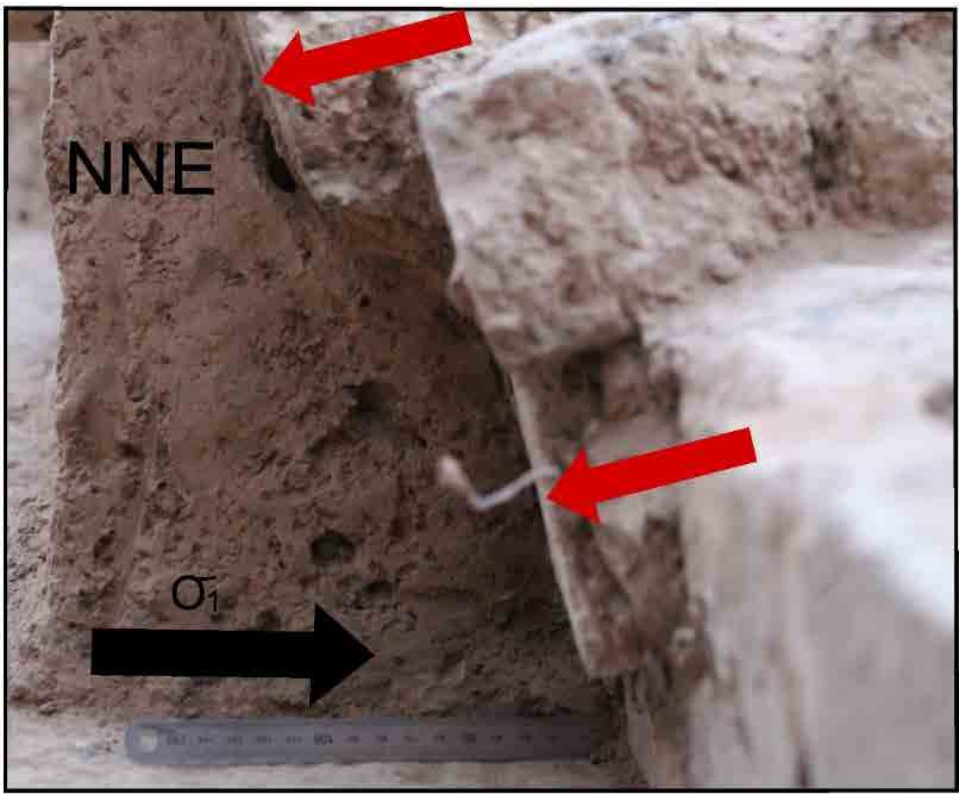


Fig. 22: Phase 4: significant leaning of the lower part of the wall toward the northeast in Trench 25; (Joint Iranian & Italian team).



Fig. 23: Phase 4: massive displacement and sliding (equivalent to one course of settled bricks) of the brick wall identified in Trench 23; (Joint Iranian & Italian team).

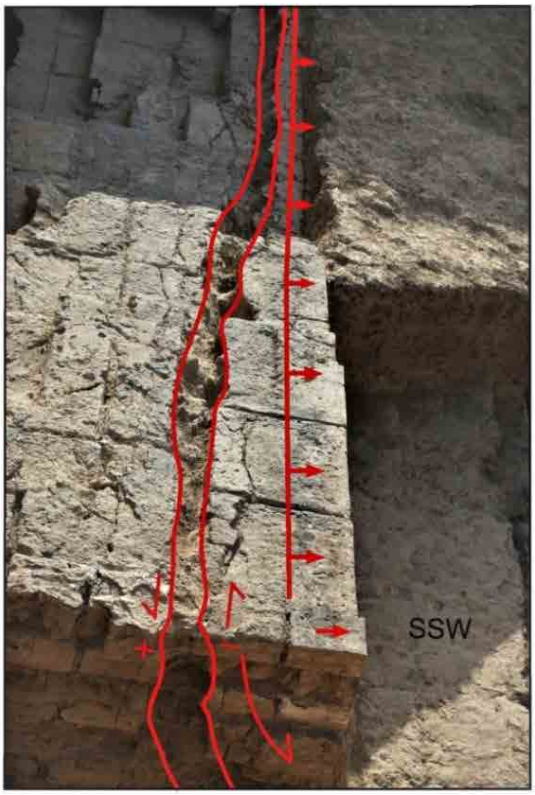


Fig. 24: Phase 4: longitudinal extension of the fracture due to the rupture and sliding of the remaining brick wall in Trench 23; (Joint Iranian & Italian team).



Fig. 25: Phase 4: earthquake; layer containing thick and compact accumulations of brick fragments; Trench 11; (Joint Iranian & Italian team).



Fig. 26: Extensive and successive looting of the bricks from the eastern and western walls throughout the gate building (Seljuk period, based on Seljuk-period mold-made ceramics found on the floors of the looting pits); (Joint Iranian & Italian team).



Fig. 27: Horizontal looting pits along with occupational traces; Trench 3. (Al-Muzaffarid period, based on Al-Muzaffarid blue-glazed ceramics found on the floors of the looting pits); (Joint Iranian & Italian team).

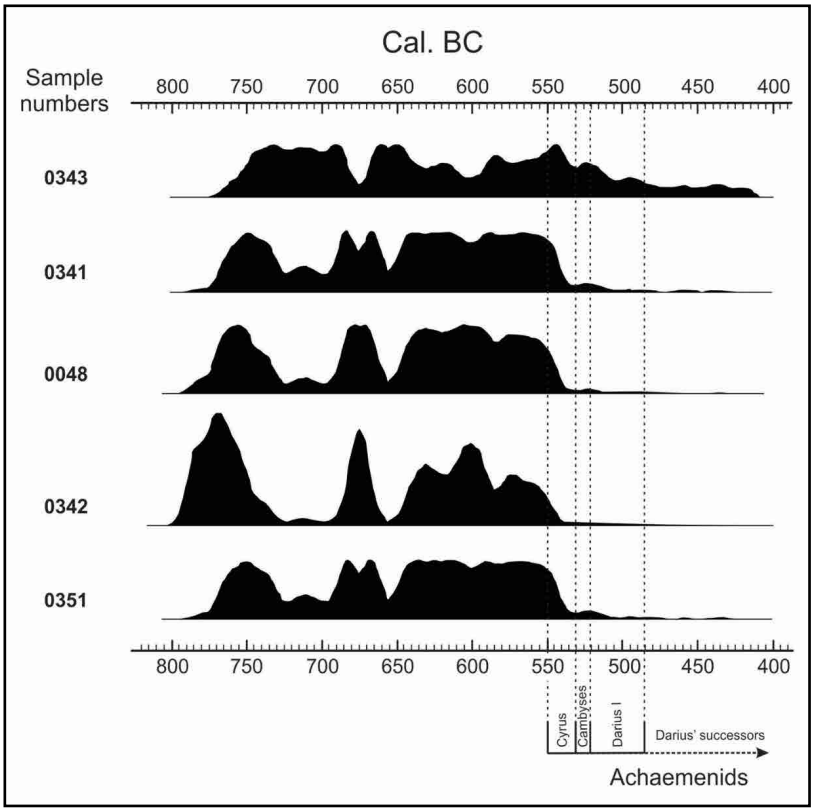


Fig. 28: Radiometric datings from Tol-e Ajori (graphic elaboration by M. Djamali of data by F. Terrasi) (Joint Iranian & Italian team).



Fig. 29: Pestle; Trench 10, Phase 3, Tol-e Ajori; (Joint Iranian & Italian team)



Fig. 30: Clay sling bullets; phase 3 (second phase of temporary occupation), Tol-e Ajori; (Joint Iranian & Italian team).

Sumner considered that, although ceramic assemblages dating to the Early Achaemenid period, i.e. "earlier than the initiation of construction at Persepolis, ca. 520 B.C.", had not yet been found in the Persepolis plain (Sumner, 1986: 7 and fn. 10), the settlement system discussed in his paper was "assumed to represent the cultural landscape in the Persepolis plain and surrounding districts from a date soon after the end of Cyrus' reign until the social and economic changes following Alexander's conquest" (Ibid). According to him, Matezziš was already an important town during Cambyses' reign, and the rebel Vahyazdata was brought here in 521 BC for execution: "At that



Fig. 31: Various fragments of the broken stone mouth from a stone lion, phase 3 (secondary occupation); Tol-e Ajori; (Joint Iranian & Italian team).

time the town of Matezziš (Persepolis West) was inhabited and the elite dwellings at Firuzi and Dasht-e Gohar were already standing" (Sumner, 1986: 28).

The chronological assessment begins with the radiocarbon evidence from the excavations.

Thanks to the support of the Franco-German project "Paleopersepolis" led by Dr. Morteza Djamali at the IMBE, Aix-en-Provence - Marseille, five bone samples were submitted to C14 dating, carried out at the Laboratory of the Center for Isotopic Research on Cultural and Environmental Heritage, Second University of Naples at Caserta, Italy, directed by Professor Filippo Terrasi. One of the samples (Sample 0351) was collected in one of the stratigraphic units below the floor level of the central room in Trench 10, three samples (0341, 0342, 0343) were collected in the same trench in stratigraphic units of the first episode of reuse of the ruins after the first abandonment and pillage, while a fifth one (Sample 0048) was collected in one of



Fig. 32: A portion of the metal arrowheads from the phase 3; Tol-e Ajori; (Joint Iranian & Italian team).



Fig. 33: Phase 3; Achaemenid jar from Trench 27, Tol-e Ajori; (Joint Iranian & Italian team).

the units of the first phase subsequent to destruction in the outer area of Trench 1.

The 14C dating analyses of the bone sample collected from the layer predating the construction of the gate provide information of the archaeological horizon prior to the construction of the gate, while the analyses of the samples recovered from the secondary occupation in Tr. 10 must provide a terminus post quem for its destruction.

The results of the analyses of four of the samples are strikingly similar (Fig. 28). Indeed, Sample 0341 and Sample 0351 have given a calibrated age (2σ-range) of 696-540 BC respectively at 76% and 75.6% probabilities, Sample 0342 has given a calibrated age (2σ-range) of 647-547 BC at 48.2% probabilities and Sample 0048 has given a calibrated age (2σ-range) of 654-541 BC at 59.2% probabilities. Only Sample 0343 has yielded a wider chronological range, with a calibrated age (2σ-range) of 764-477 BC at 97.3% probabilities.

What is indeed striking is the same age of the sample from the pre-building phase and of the samples from the secondary occupation after the first destruction. The lower limit of the latter samples coincides with that of the former. The fact that in the four similar samples, the calibration curve is practically constant throughout the duration of the range and that there are no evident peaks means that the better approximation can be anywhere within the range and at the same time shows the biases of C14 dating analyses for the Achaemenian period. In theory, given that the historical situation forces us to exclude a pre-Achaemenian dating for this Babylonian-inspired building, the significant section of the curve is reduced to its end, i.e. around 540 BC: to this date we should add the time difference provoked by the apparent age at burial due to the fact that the samples consisted in bones, corresponding to c. 10 years, bringing thus the lower limit to c. 530 BC. However, the problems shown by the calibration curve during the Achaemenian period reduces the reliability of this dating.

The time span within which the dating of the samples is possible is particularly wide and goes well beyond the period that best justifies from a historical point of view the Babylonian presence in Persia, i.e. from the conquest that Cyrus made of the city of Babylon in 539 BC (Haerinck, 1997).

While more than one colleague has encouraged us not to exclude the last decades of the Neo-Elamite kingdom (Kaniuth, 2018), the lack of other chronological data of such antiquity leads us to be more cautious and to exclude a pre-Achaemenid dating for this building. Therefore the significant part of the curves for three of the samples belonging to the secondary occupation is reduced at their end, i.e. around 540 BC: to this date we must add the shift caused by the so-called "apparent age" of the burial, due to the fact that the samples were composed of bone, bringing the lower limit to 530 BC. The low reliability of radiocarbon for the Iron Age in Iran suggests some caution in accepting the quantitative datum to the letter, but the concurrence of the dates is nevertheless a clue in favour of high dating. The Achaemenid period (ca. 550–330 BCE) largely overlaps with the so-called Hallstatt plateau of the radiocarbon calibration curve, a relatively flat section extending approximately from 800 to 400 cal BCE and named after the Hallstatt cultural period of Central Europe (Reimer *et al.*, 2020; Meadows *et al.*, 2022).

Radiocarbon ages falling within the plateau can yield broad or multimodal calibrated probability distributions so that even measurements with laboratory uncertainties of approximately ±25 radiocarbon years or less may produce calibrated age ranges spanning several centuries, in some cases approximately 250–340 calendar years at the 95.4% probability level (Meadows et al., 2022). Consequently, individual radiocarbon dates may be insufficient to distinguish events occurring within different parts of the Achaemenid period.

5. Discussion

Systematic excavations at Tol-e Ajori have established a stratigraphic sequence comprising seven principal phases in the history of the monument. The stratigraphic evidence provides a basis for pre-construction, the building's construction, occupation, abandonment, destruction, and subsequent reuse. Together with evidence from twelve other archaeological sites in the Firuzi sector, near Persepolis, the monumental gate at Tol-e Ajori contributes to our understanding of the early Achaemenid period, particularly the interval between Cyrus the Great's conquest of Babylon in 539 BC and the construction of the Persepolis terrace under Darius I, beginning around 518 BC.

The excavations have also yielded evidence relevant to the chronology of the monument. Particularly valuable are thirteen fragments of glazed bricks bearing cuneiform inscriptions.

Thus far, the inscriptions have yielded only Elamite and Babylonian logograms or syllabic signs; no Old Persian inscriptions have been identified at Tol-e Ajori (Basello, 2013; 2014; 2017). Although the absence of Old Persian inscriptions cannot be regarded as conclusive, given the limited number of surviving fragments, it remains relevant to the chronological assessment of the monument. More persuasive is the palaeographic evidence. The signs preserved on the thirteen inscribed fragments correspond more closely to Neo-Elamite and Neo-Babylonian writing traditions than to the forms of Elamite and Babylonian script employed in the royal inscriptions of Darius I and his successors (Basello, 2017: 270, 272). These palaeographic characteristics support an attribution of the gate to the early Achaemenid period.

Other finds provide additional chronological evidence, although their implications are less clear when considered individually. Preliminary ceramic analysis has identified sherds attributable to the Late Plain Ware tradition in deposits associated with the secondary occupation of the gate following its abandonment. These ceramics, however, have a broad chronological range extending from the sixth to the first centuries BC and therefore offer limited precision. The same deposits have yielded trilobate bronze arrowheads of a type generally associated with the Achaemenid period.

The structural evidence for a major earthquake following the initial abandonment and partial dismantling of Tol-e Ajori may also have chronological implications. No comparably extensive earthquake damage has been identified at the Persepolis terrace. Two explanations are possible: either the terrace sustained damage that was subsequently repaired so thoroughly that its traces are no longer apparent, or the terrace had not yet been constructed when the

earthquake struck Tol-e Ajori. The latter possibility appears more plausible in light of the available evidence (Berberian, forthcoming a, b). Archaeoseismologist Manuel Berberian has further suggested that the decision to construct the Persepolis terrace on bedrock, rather than on the less stable sediments of the plain, may have reflected an awareness of the destructive effects of the earthquake at Tol-e Ajori and other buildings in Bagh-e Firuzi. According to this interpretation, the geological conditions of the plain amplified the earthquake's effects on these earlier structures.

Additional evidence from the architecture, decoration, and spatial organization of Tol-e Ajori supports the possibility that the monument predates the construction of the Persepolis terrace. The masonry techniques and architectural design of Tol-e Ajori reflect Mesopotamian traditions. At the same time, the arrangement of a monumental gate providing access to a palatial complex recalls Gate R at Pasargadae.

The glazed-brick decoration at Tol-e Ajori also belongs to a technologically earlier tradition than that represented by the glazed bricks of Persepolis and Susa, which demonstrate further developments in production techniques (Razmjou, 2004; Amadori *et al.,* 2017a; 2017b; Daucé, 2010: 329–330). The decorative programme likewise differs from that of Persepolis. Its emphasis on mythological creatures recalls certain aspects of the imagery associated with Palace S at Pasargadae. Particularly distinctive is the representation of the mušḫuššu, a composite creature associated with the Babylonian god Marduk. This motif is absent from the surviving monumental decoration of Pasargadae, Persepolis, and Susa, although it appears on impressions of Late Babylonian seals preserved in the Persepolis archives (Garrison, 2009: 46; Matin, 2021).

Geophysical surveys conducted in the fields between the archaeological sites of Bagh-e Firuzi have identified long, linear anomalies interpreted as a network of ditches or canals. Although less dense than the corresponding network west of Persepolis, these features exhibit orientations that differ from those recorded nearer the terrace. This difference suggests that the two areas may reflect distinct episodes of spatial planning (Gondet, 2011; Askari Chaverdi *et al.,* 2013).

Taken together, these observations support the hypothesis that the Tol-e Ajori–Firuzi 5–Sang-e Surakh complex (Fig. 14) belongs to an earlier phase of development than the Persepolis terrace. The comparatively early techniques employed in the glazed-brick decoration, the monument's architectural resemblance to the Ishtar Gate of Babylon, and its possible commemorative association with Cyrus's conquest of Babylon in 539 BC are consistent with construction during the reign of Cyrus. Under this interpretation, the gate may have served as a monumental expression of the Persian conquest of Babylon.

The combined archaeological, architectural, palaeographic, and historical evidence therefore favours a date for the foundation of the Tol-e Ajori gate before the construction of the imperial complex at Persepolis under Darius I, possibly between 539 and 518 BC. None of these lines of evidence independently establishes a precise construction date. Their convergence nevertheless

lends support to the proposed chronology. Alternative dates based on particular aspects of the evidence, including those discussed by Kaniuth (2018: 351), warrant consideration, but must also be assessed against the broader archaeological and historical context. Further discoveries may permit a more precise chronological attribution.

This evidence also bears on the function of the gate and the character of the surrounding complex. The monument's scale, architectural form, and decoration suggest an association with the Achaemenid royal establishment. This interpretation receives additional support from the occurrence of the word "king" in Babylonian and Elamite among the surviving cuneiform inscription fragments. The possible involvement of Babylonian workers in the construction of Tol-e Ajori would also be consistent with documented Achaemenid practices of employing Babylonian labor in imperial building projects.

The results of the excavations consequently favor interpreting Bagh-e Firuzi East, approached through the monumental gate at Tol-e Ajori and perhaps centered on the building at Firuzi 5, as an imperial complex rather than solely as the dispersed urban quarter proposed by Sumner (1986). Its arrangement may have resembled the extensive royal paradeisos at Pasargadae, with its monumental gateway, palace, and bridge. Such an interpretation recalls Stronach's characterization of an unfinished "garden capital" (Stronach, 1997). The spatial relationships among the principal components of Bagh-e Firuzi East reinforce this interpretation. The alignments connecting Tol-e Ajori, Firuzi 5, Sang-e Surakh, and the canals identified through geophysical survey suggest a coordinated arrangement of buildings and associated infrastructure. These features evoke what Stolper described as "the architectural trappings of a remarkable political centre" (Stolper, 1984). Comparable principles of spatial organization are evident at Pasargadae and Persepolis, lending further support to the proposed imperial character of the complex.

In his study of Babylonian texts associated with the Persepolis Fortification archive, Matthew Stolper (1984: 307) argued that Matezziš "was already the chief place in the region before the reign of Darius and so before the construction of Persepolis began." Stolper drew particular attention to eleven Babylonian legal documents of uncertain provenance, dating to the reigns of Cambyses and Bardiya, which refer to Babylonian temple workers at a place identified in the texts as Humadēšu. Following a suggestion by Ilya Gershevitch, Ran Zadok (1976: 69–70) identified Humadēšu with the Old Persian Uvādaicaya mentioned in the Bisotun inscription, corresponding to the Elamite Matezziš. On this basis, Stolper concluded that Matezziš "was the home of an enclave of Babylonians during the reign of Cambyses" (1984: 307). The employment of Babylonian temple workers in the Persian heartland is also documented elsewhere. During the reign of Cyrus, Babylonian workers were employed at the site known in Greek sources as Taoke, which Wouter Henkelman has identified with Tamukkan in the Elamite Persepolis texts and Tahmaka in Babylonian documents referring to workers dispatched to the site (Henkelman, 2008: 116–117; see also: Tolini, 2008). Another location in Fars associated with Babylonian labour during the reign of Cambyses is Matnânu, identified with Matannan in the Persepolis texts (Stolper, 1984; Henkelman and Kleber, 2007: 164).

The identification of Humadēšu with Matezziš, and the location of Matezziš in the Persepolis region, have gained considerable acceptance, although earlier scholarship advanced alternative interpretations (Hansman, 1975; Zadok, 1976). We therefore follow the identifications proposed by Stolper, Sumner, and Henkelman, while recognizing that they remain open to reassessment. Even if the identification of Humadēšu with Matezziš were ultimately rejected, documentary evidence from other sites would still establish the employment of Babylonian workers in Fars under the early Achaemenid kings. This broader historical context is consistent with the material evidence for Babylonian involvement at Tol-e Ajori.

Sumner (1986) proposed that several of the elite buildings at Bagh-e Firuzi belonged to a programme of territorial development predating the reign of Darius I. Although he acknowledged that no ceramic assemblages securely attributable to the early Achaemenid period had yet been identified in Fars (Sumner 1986: 4), he considered the settlement system described in his study to represent the cultural landscape of the Persepolis plain and its surrounding districts from shortly after the end of Cyrus's reign until the transformations associated with Alexander's conquest (Sumner, 1986: 7). Sumner further argued that Matezziš was already an important settlement during the reign of Cambyses. He connected this interpretation with the execution of the rebel Vahyazdata at Matezziš in 521 BC, concluding that "At that time the town of Matezziš (Persepolis West) was inhabited and the elite dwellings at Firuzi and Dasht-e Gohar were already standing" (Sumner, 1986: 28).

This reconstruction has not been universally accepted. Gondet (2011), in particular, questioned whether the buildings at Bagh-e Firuzi and the palace at Dasht-e Gohar were contemporary. His argument rests partly on the corresponding orientations of the tomb at Takht-e Rostam and the large building at Dasht-e Gohar. Jean-Claude Bessac and Rémy Boucharlat had previously reconsidered the traditional attribution of Takht-e Rostam to Cambyses, proposing instead that Darius I constructed the tomb for his father, Hystaspes, an interpretation also supported by Henkelman. On this basis, Gondet suggested that the building at Dasht-e Gohar may likewise date to the reign of Darius I and represent an extension of his imperial building programme (Gondet, 2011: 338–339). This interpretation raises a broader methodological problem concerning the chronological attribution of architectural forms conventionally associated with the early Achaemenid period. Similar architectural features occur at Pasargadae and at several buildings in Borazjan generally attributed to the reign of Cyrus. The definition and chronological significance of an "early Achaemenid style" are also examined in E. Matin's doctoral research, currently being prepared for publication (Matin, Forthcoming b).

The present evidence does not permit us to offer a revised date for Dasht-e Gohar. Nevertheless, the results from Tol-e Ajori favour the broader chronological framework proposed by Stronach and accepted by Stolper, which places the beginnings of imperial construction in the Pārsa plain "both during and directly after the reign of Cyrus," rather than exclusively during the reign of Cambyses, as Sumner proposed.

The proposed chronology for Tol-e Ajori also provides a possible explanation for the two distinct spatial planning systems identified in the Pārsa/Matezziš region. If the Persepolis terrace represents a major phase of imperial development initiated under Darius I, the Tol-e Ajori–Firuzi 5 complex may belong to an earlier programme of construction. The architectural, decorative, and spatial evidence thus supports the existence of an early Achaemenid phase preceding the establishment of the Persepolis terrace. This interpretation is broadly consistent with the historical and archaeological reconstructions advanced by Hallock (1977), Tilia (1974, 1978), Stronach (1997), Stolper (1984), Sumner (1986), and Henkelman and Kleber (2007), although these scholars differ in their proposed chronologies and interpretations of individual sites.

The extent and precise function of the complex comprising the Tol-e Ajori gate, the palace at Firuzi 5, and the canal or bridge structure at Sang-e Surakh remain uncertain. One possibility is that these features formed part of a royal paradeisos comparable to that at Pasargadae. The evidence does not, however, exclude the possibility that the complex also incorporated elements of a dispersed urban settlement, anticipating aspects of the later development of Pārsa. The relationship between this complex and the elite buildings elsewhere in Bagh-e Firuzi, which Sumner interpreted as components of a broader aristocratic settlement, is particularly difficult to establish because of the distances separating the surviving structures. At present, their respective orientations provide the principal basis for assessing whether individual buildings belonged to the same spatial planning system or to successive phases of development.

6. Conclusion

The glazed bricks at Tol-e Ajori appear to reflect an earlier technical tradition than those employed at Susa and Persepolis. Together with the gate's close resemblance to Babylon's Ishtar Gate, this evidence supports the possibility that the monument was built after Cyrus's conquest of Babylon in 539 BCE and before construction began at Persepolis. The proposed association with Firuzi 5 and the stone bridge at Goud-e Gamishi (Sang-e Surakh) would place these features within an earlier phase of development, although their contemporaneity requires independent assessment.

Geophysical surveys between the Bagh-e Firuzi sites identified linear anomalies interpreted as ditches or canals. These features are less densely distributed than those west of Persepolis and follow a different orientation from features near the terrace. The contrasting alignments may reflect separate episodes of planning. Taken together, the architectural, decorative, and topographical evidence supports a date for the Tol-e Ajori gate before Darius I's construction of Persepolis, perhaps between 539 and 518 BCE. None of these observations independently establishes that date, and further evidence is needed to refine the chronology. The excavations nevertheless document a monumental gate in the Firuzi sector and a sequence of abandonment, secondary occupation, structural destruction, and later brick robbing.

One possible explanation for the gate's construction is that Cyrus commissioned a monument in his homeland to commemorate the conquest of Babylon. Its Babylonian iconography is consistent with such an interpretation, but the available evidence does not establish the patron or precise construction date. Further study of the inscribed glazed-brick fragments may identify the ruler referred to as "king" in two inscriptions. Even without such a discovery, Tol-e Ajori provides evidence for monumental building activity in the early Achaemenid period in the region where Darius I later established Persepolis.

Thirteen seasons of excavation and associated epigraphic research have substantially expanded the evidence for early Parsa. Further interdisciplinary study is needed to clarify the monument's chronology, its relationship to neighboring buildings, and the wider settlement history. The Iranian–Italian Joint Archaeological Mission and the Iranian authorities are also working to make the site accessible to visitors to Persepolis.

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Authors' Contribution

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Conflict of Interest

The authors declare no conflict of interest and have adhered to publishing ethics regarding citations and references.

Endnote

1. In this brief article, only an abstract of Phase I is provided, as a comprehensive description including architectural details of Phase I has been published in a Persian article; see: Askari Chaverdi, A., & Callieri, P. (2025). "The Architectural Structure and Decorations of the Monumental Gate of the Paradise of Parsa in the early Achaemenid Period (Tol-e Ajori)," Journal of Archaeological Studies, 118(1): 213–268. Also cf. https://doi.org/10.22059/jarcs.2025.402260.143376

2. The ceramic finds from this stage exceed 500 sherds and will be published in a separate volume.

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یک تاریخچهٔ لایه‌نگاری از سرگذشت دروازهٔ پردیس پارسه در تل آجری

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چکیده

بنای مکشوفه در محوطهٔ باستانی تل آجری در سه کیلومتری شمال‌غربی تخت‌جمشید طی ۱۳فصل کاوش بـه اسـتناد کتیبه‌هـای مکشـوفه و کاربـری آن به‌عنـوان دروازه‌ای همتـای دروازهٔ ایشـتار بابـل شناخته شد. لایه‌نـگاری ایـن بنـا دورهٔ قبـل از ساخت بنـا(ه) ساخت دروازه (دورهٔ ۱)، زمان ترک‌شدن بنـا (دورهٔ ۲)؛ سکونت مجـدد در مقیـاس محلّی (دورهٔ ۳)؛ غـارت و نابـودی بـا منشأ انسـانی و طبیعـی؛ زلزلـه (دورهٔ ۴)، و غارت آجرهای بنا در سده‌های میانهٔ اسلامی: دورهٔ سلجوقی (دورهٔ ۵) و آل‌مظفر (دورهٔ ۶) را نشـان می‌دهـد. تاریخ‌گـذاری مطلـق پنـج نمونـهٔ اسـتخوان از تـل آجـری بـا قابلیـت پاییـن اطمینـان رادیـو کربـن بـرای عصـر آهـن ایـران (۸۰۰-۴۰۰ پ.م.) نشـان‌دهندهٔ احتیـاط در پذیـرش مطالعـات کمّـی اسـت. تاریخ‌گذاری نسبی ساخت دروازه، جنبه‌های دیرینه‌نـگاری ۱۳آجـر نبشته، نَـه بـا شـیوهٔ نـگارش ایلامی و بابلی در کتیبه‌های هخامنشی داریـوش اول و جانشینانش، بلکه با نشانه‌های متأخر سنّت دورهٔ ایلام نـو و بابل نـو، قدمت آجرهای لعابدار تل آجری که از نظر فنی به شیوهٔ باستانی‌تری نسبت به آجرهای شوش یـا تخت‌جمشید تعلق دارد و کارکرد احتمالی نسخه‌ای از دروازهٔ ایشتار بابل درنظر گرفت کـه در تئـوری بایـد بـه احتمـال زیـاد در دورهٔ سلطنت کـوروش و مرتبـط بـا فتـح بابـل در سـال ۵۳۹پ.م. باشـد. تمـام عناصـر قویـاً حکایـت از پایه‌گـذاری دروازهٔ تـل آجـری قبـل از سـاخت دژ شـاهی تخت‌جمشـید توسـط داریـوش اول، بـه احتمـال در بـازهٔ زمانـی ۵۳۹ تـا ۵۱۸پ.م. دارد.

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