

## Preservation of the Iraqi Archaeological Architectural Heritage – Current conservation projects in Uruk (southern Iraq)

The archaeological cities of Uruk and Ur and the Tell Eridu archaeological site form part of the remains of the Sumerian cities and settlements that developed in southern Mesopotamia between the 4th and the 3rd millennium BC in the marshy delta of the Tigris and Euphrates rivers. They became part of the UNESCO World Heritage List in 2016.

Uruk is considered to be the first metropolis of mankind. Founded at the end of the 5th millennium BC, about 40000 people lived and worked here as early as 3000 BC. Key achievements of civilization such as writing, or the development of sophisticated administrative and social structures originated in Uruk. Uruk was only eclipsed in size by Babylon at around 600 BC.

The German Oriental Society and later the German Archaeological Institute (DAI) have been excavating monumental as well as residential and commercial

buildings on the site of Uruk since 1912. A large part of these building remains consists of earth blocks. With the awarding of World Heritage status, came an obligation to establish a conservation strategy for the archaeological site. This task is managed by the DAI and planned and implemented by Klessing Architekten, Berlin, and ZRS Ingenieure, Berlin, together with local colleagues from the State Board of Antiquities and Heritage Iraq (SBAH).

In autumn 2018, the first measures for preservative conservation were implemented. Among other things, 10 m<sup>3</sup> of new earth block masonry was built in an endangered area at the so-called Eanna Ziqqurrat. In late autumn 2020, work is supposed to begin on the protective conservation of the so-called White Temple. These are the last, more than 5000 years old remains of the only high temple preserved on a ziqqurrat. This building also consists of earth blocks.

### 01 Uruk, Remains of the Eanna Ziggurat in 2016



### **Historical background of architecture at Uruk**

Located 300 km south of Baghdad and about 15 km east of the provincial town of Samawa, the ancient metropolis of Uruk lay on the western fringe of the Sumerian heartland in the alluvial lowlands between the Euphrates and Tigris rivers. Uruk was inhabited almost continuously from the 5th millennium BC to the 3rd and perhaps even the 4th century AD, i.e. for a time span of around 5000 years.

The metropolis of Uruk probably evolved from two larger or several smaller, closely situated settlements on both sides of the Euphrates that can first be attested in the 5th millennium BC, in the late Ubaid period. These communities expanded rapidly, and by the turn of the 3rd millennium BC they had grown into an integrated urban area of huge size, covering approx. 5.5 km<sup>2</sup> and rising up to 19 m above the original ground level. At that time, a city wall of 9.5 km length was erected, which already in the 3rd millennium BC was commemorated as a heroic deed of the famous king Gilgamesh. As such, the enclosed city of Uruk was the largest known city in the ancient world, and it retained that renown until the 6th century BC, when the city of Babylon grew to occupy an even larger area.

Already some time earlier, at the end of the "Late Uruk period" (second half of the 4th millennium BC) the city encompassed an area of 2.5 km<sup>2</sup> and, after more than 1000 years of habitation at the same site, was considerably higher than the surrounding alluvial plain. The city now comprised a centre in the middle of the nearly round agglomeration of mounds and lower areas surrounding it. Excavations were able to reveal buildings from this period at different locations in the immediate centre of the city. Insight into daily activities and crafts were gained from investigations at the fringe of the central area.

The architecture of that period consisted of an early ziggurat, a temple on top of a high terrace as well as several representational structures of considerable size. The ziqqurrat, perhaps the sanctuary of Anu, god of the heavens, stood at the southwestern boundary of the city centre while the representational structures were erected in its northeastern part. The latter buildings were distinguished by their remarkable size, a precise architectural plan and an elaborate division of the external façade. The long rectangular structures consisted of an arrangement of rooms that

focussed on a central hall, occasionally ending with a T-shaped head, or they comprised simple yet impressively ordered halls. The façades either exhibited a marked division into decorative niches or were covered with ornamental mosaics of clay or stone cones in various colours.

Several remarkable developments were noted during that period: Following the invention of the rapidly revolving potter's wheel, pottery was made almost exclusively in mass production, which would thus require a well-organised social structure. On the other hand, fragments of large sculpture and stone reliefs, small animals made of stone, elaborately sculpted stone vessels and exquisitely carved cylinder seals found in Uruk are not only a manifestation of the wealth and power of the contractors; they also demonstrate the astounding craftsmanship of the artisans. A further innovative development took place in Uruk, which was to have far-reaching effects in the history of civilisation: the invention of writing. First evidenced around 3300/3200 BC, this script was initially employed to record administrative matters. Uruk at that time obviously played a major political and, most probably, economic role in southern Mesopotamia and beyond.

Around 3000 BC, buildings and settlement layers from the Late Uruk period were levelled, filled in and rebuilt with new structures. Now, a sacred precinct formed the city's centre, where since the 3rd millennium BC at the latest, the Eanna sanctuary of Inanna/Ishtar, goddess of love and war, stood. During the 3rd Dynasty in Ur (22nd/21st century BC), this sanctuary underwent major re-building that eventually led to the canonical form of central sanctuary in southern Mesopotamia which comprised a ziggurat in a central courtyard, surrounded by further courtyards and which was in use in southern Mesopotamia for a long time. As can best be observed in the ziggurats in Ur and Uruk, the resumed ziqqurrat form constitutes two rectangular high terraces, one above the other, upon which a temple is located. Access to the lowest terrace (more than 11 m in height) is provided by an external, T-shaped staircase, which is comprised of an axially arranged central staircase, adjoined by two side stairs, each linked to the terrace. At the beginning of the 2nd millennium BC, Uruk became the capital of a local dynasty of kings who erected one of the largest palaces unearthed in Mesopotamia. Cuneiform texts inform us about their restricted political



02 Rendering showing a reconstruction of the Eanna Ziggurat dedicated to the goddess Inanna/Ishtar towards the end of the 3rd millennium BC. (Source: artefacts-berlin.de; based on material from the Deutsches Archäologisches Institut)

influence and at the same time about their economic ties with different regions as well as the care the kings applied to the existing sanctuaries in Uruk. At the end of the 18th century BC, drier climatic conditions as well as, perhaps, the shift of interregional waterways forced most inhabitants to leave the city and it was only in the 15th century BC, the Kassite period, that major building activities and settlement on the old mounds can be observed. Again, the major focus was the care for the Eanna sanctuary where King Karaindash added a peculiar, little temple building. Uruk during the following centuries played a considerable economic role for the southern marshlands and was part of the so-called 'sealand' until the first half of the 1st millennium BC. The city was strategically important during the Assyrian conquests in southern Mesopotamia (9/8th century BC), and it experienced several enlargements and alterations under the Chaldean rulers (7/6th century BC), the Achaemenid (6-4th century BC) and the Seleucid periods (3rd-2nd century BC). Still, construction measures are evidenced especially in the Eanna sanctuary and also in the expansive residential area in the immediate vicinity of the sanctuary. Especially during these periods, thousands of clay cuneiform tablets elucidate the economical foundations and activities of the times, revealing the intermittent close relationship between Uruk and the capital city Babylon in a political and – above all – economical aspect.

Yet, during Achaemenid domination there was also a profound change in cult in Uruk. While the Eanna

sanctuary continued to serve as a place of cult, under Artaxerxes I or II there was a vigorous renaissance of the cult of Anu, god of the heavens, and his place of worship was re-built next to the Anu ziqqurra at the northwestern part of the city centre that was so important during the 4th millennium BC.

With the monumental enlargement of this Anu sanctuary "Bit Resh" (approx. 36,000 m<sup>2</sup>) and the erection of a new Anu ziqqurra (approx. 12,000 m<sup>2</sup>) during the Seleucid period as well as the installation of the Inanna/Ishtar cult in a new temple complex "Irigal", likewise a monumental building, the ancient sacred centre of the city lost its importance. The major places of cult were now situated on the southern fringe of the city's centre. Central parts of both the Bit Resh and the Irigal have been excavated. Despite their construction in Seleucid times, they exhibit a typical Babylonian ground plan. Both building complexes encompass a temple complex with the long-known room arrangement: a central, closed cella on a lateral axis with an ante-cella, and the adjoinment of several courtyards which also offer access to further cellae. The accompanying economic and administrative units also had a place within these complexes.

After 141 BC Parthian rulers assumed power in Mesopotamia. Uruk lay on one of the important trade routes between the Arabian-Persian gulf and Syria, and, consequently, the city flourished economically once again in its long history of settlement. Nearly all areas of the city were inhabited. Nonetheless, the an-





03a and b So-called "pillar hall" after excavation (a) and current situation after back-filling (b)

cient temple complexes were given secular purposes. To date, two new temples built in Parthian times have been attested. Their architecture clearly derives from Hellenistic-Roman temples. Similarly, the adaptation of western styles becomes increasingly distinct in the sphere of daily activities. Uruk was still densely settled, when conquered by the Sasanians in the middle of the 3rd century AD. Nonetheless, a sudden shift of settlement to the eastern suburbs is archaeologically perceptible. Thereafter, in the 4th/5th AD the population in the region gradually decreased and the city of Uruk was ultimately abandoned.

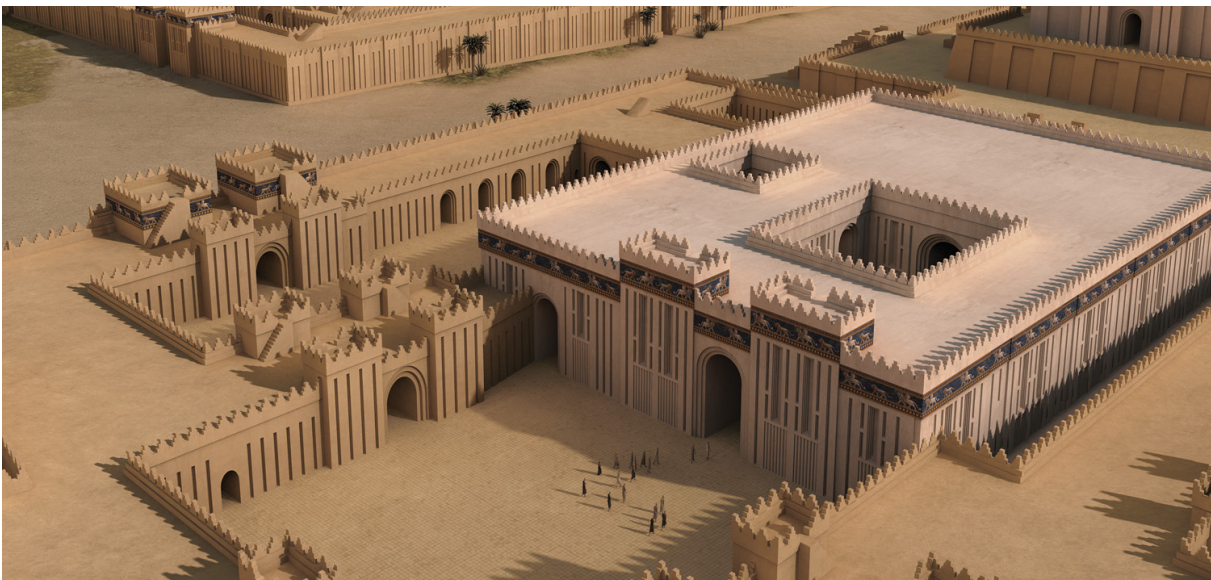
#### Archaeological background

Excavations have been conducted systematically in Uruk since 1912. At first the two sanctuaries in the centre of the city stood in the foreground. After World War II investigations also took place in a palace of the

Old-Babylonian period at the western margin of the city and in residential sections from Neo-Babylonian and Seleucid-Parthian times. Yet, due to the exceptional size of the city, in more than 40 field expeditions less than 5% of the entire urban expanse could be investigated through excavations. Nevertheless, excavations have resulted in a relatively comprehensive picture of this renowned city.

The excavations in Uruk gained scientific significance through a particular circumstance: the expansive Eanna sanctuary of Inanna/Ishtar in the city's centre took on a form in the 22nd century BC that was retained throughout the following 2500 years, despite numerous substantial modifications. A ziggurat was erected in the centre, surrounded by several courtyards of various functions. The courtyards remained in use for hundreds of years without any greater

04 Rendering showing a reconstruction of the Seleucid temple complex for the ancient Mesopotamian goddess Anu from the 3rd-2nd century BC. (Source: artefacts-berlin.de; based on material from the Deutsches Archäologisches Institut)





05a and b The railway during excavations (a) (1923) and during reactivation (b) in 2018

changes. Their enclosure walls were renewed from time to time, but the construction within the walls was limited. Thus, only few architectural remnants which would have been particularly worth preserving were found below the surface of courtyards dated to the 1st and 2nd millennia BC.

Consequently, excavations reached settlement layers of the 3rd and – above all – the end of the 4th millennium BC relatively quickly. It was in the latter level, “the Late Uruk period”, that remains of monumental buildings were found over a large surface, which became known as the typical architecture of this period. Thus far, no architectural rests have been recovered in such an expanse at any other site. Therefore, essential information on these historical periods can be gained solely from the excavations in Uruk. However, the walls of the Uruk period structures were usually preserved at a height of only a few centimetres. While their ground plan and the particularities of their architecture could still be well documented, backfilling of the excavation area was the only possible way to preserve the structures. Larger buildings, on the other hand, were excavated and studied and kept open for the information of visitors. After more than 100 years of field research most of them suffer from erosion and urgently need conservation interventions.

Excavated building remains mainly consist of bricks, rarely of natural or artificial stones and, above all, massive earth structures; some are made of rammed earth but mainly of earth blocks.

#### **Development and implementation of a conservation and training strategy**

With the awarding of World Heritage status in 2016, an obligation arose to establish a coordinated con-

servation strategy for the archaeological site. This task is managed by the DAI and planned and implemented by Klessing Architekten, Berlin, and ZRS Ingenieure, Berlin, together with local colleagues from the State Board of Antiquities and Heritage Iraq (SBAH).

A system was developed and implemented for the following tasks:

- Investigation of the damage mechanisms in general and in detail
- Investigation of individual buildings or its remains
- Implementation of a monitoring system
- Development and management of a priority list
- Development and implementation of emergency conservation and conservation measures
- Development and implementation of maintenance plans and manuals.

As expected, the high moisture and salt content in the soil, combined with the typical climatic conditions of hot arid climate zones, has led to a strong accumulation of salts harmful to buildings in the evaporation zone. The delamination of materials associated with salt crystallisation results in the loss of substance from high-quality surfaces such as glazes to the partial collapse of parts of buildings. This process was greatly accelerated in the winter of 2018/2019 by above-average rainfall. It is worth noting that many of the remains of buildings are still covered with historical functional horizontal bitumen mortar waterproofing, which still limits this damage pattern today. Further damage phenomena are above all direct surface erosion by direct wetting with rain or rinsing out of concentrated draining water as well as wind abrasion. Unconscious and deliberate damage by tourist groups in the still insufficiently prepared ruin landscape is also a major problem.





06a and b Uruk, Eanna Ziggurat west corner before conservation work (a) and yellow straw in the mortar of the existing fabric (b)

A monitoring system was introduced for areas with particularly critical conservation status or high cultural-historical significance. For this purpose, forms were developed, which are filled in by colleagues of the local antiquities authority at regular intervals or after special climatic events (e.g. heavy rain). These forms make it possible to compare the respective condition with the condition at the beginning of the records. If necessary, measures can be derived from the changes. The local staff of SBAH took part in a one-year programme in Germany on documentation and preventive conservation of architecture developed by the DAI, and the application of this knowledge has been implemented together on site. A priority list for emergency safety and conservation measures is updated constantly, taking into account the current state of preservation, which is recorded by the monitoring system, the cultural value, the location on the future visitor route and the financial and human resources available. Based on the detailed investigation, emergency conservation and conservation strategies are being developed for the individual objects and worked out down to the last detail. The strategies are drawn up in accordance with the UNESCO statutes and discussed with the relevant bodies. Part of the conservation strategy must always be the subsequent maintenance strategy. It is already clear that the huge area of ruins requires constant conservation and maintenance work.

#### Conservation measures already carried out

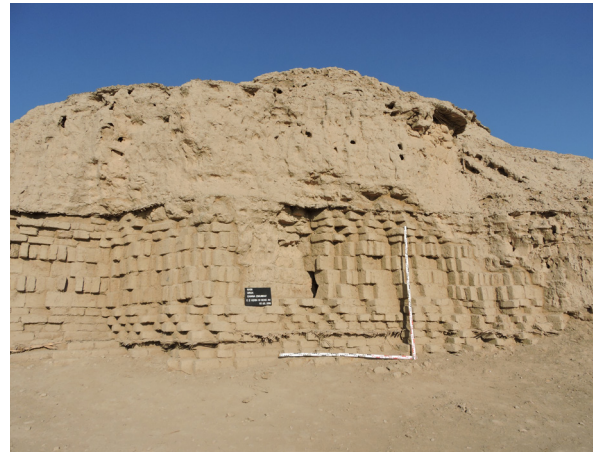
In the area of the archaeological site of Uruk there are currently no fixed visitor paths but only informative paths, which run partly directly over valuable findings. An interim circulation path for visitors was developed by blocking traditional paths and prepar-

ing dump dams of previous excavations to assist the movement of visitors.

In order to be able to transport building materials on the site with as little damage as possible to the historical features, the historic narrow-gauge raised railway was reactivated, which was used during the time of the large-scale excavations up to the late 1960s. It turned out that the technology is so robust that it could be reactivated some 50 years later without major problems. The transport of building materials could take place as planned with the help of the railway.

The first major protective conservation measure was carried out at the western corner of the Eanna-Ziggurat. The Eanna-Ziggurat, the high temple of the goddess Ishtar, is a huge construction of two massive platforms and consisted of approx. 3.5 million earth blocks. The ziggurat is reinforced by regular reed mat layers and ropes in such a way that a relatively steep formation was possible. The reed mat layers still help reduce surface erosion today. Since the reed mats represent a tensile reinforcement, the erosion causes the formation of partly steep edges. At the western corner considerable masonry masses had already broken off and further areas threatened to fall.

In order to prevent further loss of original masonry, approx. 10 m<sup>3</sup> of new masonry was underlaid at the overhanging areas. The composition and properties of the earth blocks are similar to the historical ones. The masonry mortar was additionally mixed with sand to achieve a lower degree of shrinkage than the historical mixture which was necessary to prevent the new masonry from tearing off from the existing masonry. In a few places where this happened, a thin



07a and b Making earth blocks in the traditional method (a) and a view of the western corner of Eanna Ziggurat after completion of conservation work (b) in 2019

mortar was injected into the resulting crack in the following campaign, i.e. after completion of shrinkage.

The Anu Ziggurat was erected in several building layers during the 4th millennium BC, each consisting of a high platform and a temple on top. Each platform was strengthened with bands of pottery pegs in the form of bottles. For this, double or triple rows of such clay bottles were embedded into the massive earth block core of the Ziqqurat platform as well as into a freestanding earth block wall, which represented a staircase parapet. Thus, by forming decorative friezes, they at the same time improved the weather stability of the construction. In the excavated areas, remains of these friezes exist only in a few places in stretches of about 50 to 100 cm length, and these are in danger of breaking out. As an interim measure the decision was taken to secure them in their actual position, and to focus on the preservation of the clay bottles themselves at a later date. The position of the clay bottles was secured with earth mortar of various consisten-

cies. While larger areas were repaired with normal mortar consistency, cracks and small-particle findings were applied with fine earth mortar in a pulpy consistency using a syringe and brush. Before applying the mortar, corresponding areas of loose earth particles and crusts were carefully removed and the surfaces were sprayed with water.

A further emergency conservation measure that was undertaken to stabilise the architectural structures was carried out at the so-called stone building and at the Gareus temple made of baked bricks. Different materials for the planned walkway were also tested in small areas.

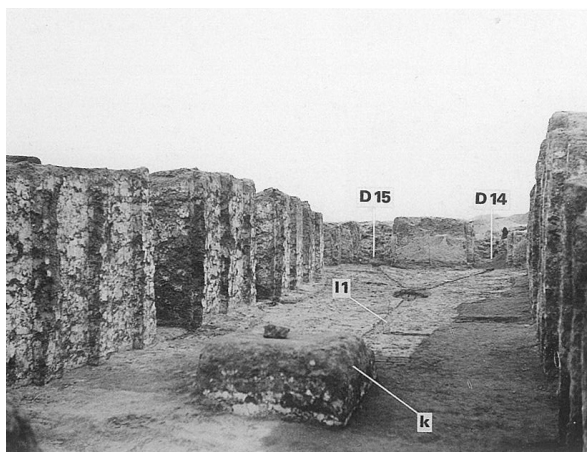
### Outlook

In late autumn 2020, work was scheduled to begin on the protective conservation of the so-called White Temple but has now been postponed until 2021 due to the current travel restrictions. The White Temple site contains the more than 5000-year-old remains

08a and b Uruk, Anu Ziggurat, The clay bottles before (a) and after (b) securing measures







09a and b The White Temple after excavation (a) and its present condition (b) in similar direction of view

of the last existing Mesopotamian temple. This building is also made of earth blocks.

In the phase of securing conservation, the proposal is to bond a layer of earth blocks to the healthy core of the masonry remains. In all cases, this additional brickwork will lie behind the historical edge of the respective component. After careful consideration of the desirability of such measures, this protective brickwork can be supplemented as a partial reconstruction. While the conservation measures can only be determined by technical expertise, the actual conservation measures and in particular the partial reconstructions must be coordinated with the UNESCO committees.

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