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The Roman Baths Of Aquae Thibilitanae -Guelma Province

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Abstract

This study investigates the archaeological site of Hammam Debbagh, known in antiquity as ad Aquae Thibilitanae, located in the Guelma Province of Algeria. Renowned for its thermal springs, the site held significant strategic value during the Roman period due to its fertile lands, abundant freshwater resources, and natural defensive advantages. The Romans exploited these features by constructing an elaborate bath complex that utilized the natural heat of the hot springs, eliminating the need for conventional heating systems. The research explores the site's topography, historical significance, and architectural components, uncovering structures such as baths, pools, and various Roman era remains. However, due to the site's advanced deterioration and the wide dispersal of archaeological remains across a large area, reconstructing the spatial relationships between these structures presents a major challenge. Among the notable discoveries is a well-preserved pool adjacent to a domed structure, though their precise function and spatial organization within the complex remain unclear.

A detailed architectural analysis highlights the Roman construction techniques employed at the site, including opus incertum and opus quadratum, as well as the use of locally sourced materials such as stone, debesh stone, and Roman bricks. Despite its historical and archaeological importance, the site lacks formal protection, and parts of it have been damaged or destroyed due to modern construction activities.

This study underscores the urgent need for systematic and comprehensive excavations to fully uncover and document the site's various components. Such efforts would enable a more accurate reconstruction of its historical context and a deeper understanding of its role within the broader framework of Roman heritage in North Africa.

Keywords: Roman archaeology, Roman baths, Aquae Thibilitanae, archaeological sites, excavations.

Introduction:

Water and its sources have long been vital elements for human survival, especially during the Roman era. The Romans, driven by their expanding needs for raw materials and natural resources to support their urban growth, sought to expand and establish settlements at the expenses of neighboring regions. In the early 2nd century BCE, their attention turned to North Africa. By the 1st century CE, they had reached *ad Aquae Thibilitanae*, transforming it into a Roman settlement. Here, they constructed significant architectural structures, both public and private, to exploit the area's resources and enhance its potential within the framework of their colonization strategy.

The region of *ad Aquae Thibilitanae* held considerably importance due to its unique features, such as its natural fortifications, fertile lands, and abundance of fresh water sources. Of note were the hot springs with temperatures reaching up to 90 degrees Celsius. The area was also known for its short winter days and cold temperatures. The Romans took advantage of these natural features by constructing bathing facilities that stood out for their unique architectural style. Unlike other Roman baths, these structures did not require the typical heating systems, as the waters were naturally hot. This allowed the architects to innovate in the design of these baths, making them distinct from those found elsewhere.

Aquae Thibilitanae

The ancient city of Hammam Debbagh, also known as Aquae Thibilitanae, was situated along a Roman road (Bernelle, 1892, p.65), connecting Hippo-Regius with Thibilis. Located west of Calama, a city linked to the Cirta-Hippone road, Hammam Debbagh. It is within the borders of the proconsular province and held the status of a Roman station, as documented in Antonine's Itinerary (O.M. Carthy, 1886, p.28). (Fig.1)

Today, Hammam Debbagh corresponds to a municipality in the northwestern part of Guelma, Algeria. Established in 1985 with an area of 7,645 hectares, it lies 18 kilometers from the city center (Bernelle, 1892, p.65), north of National Road N°20 (connecting Guelma to Al-Khrroub and Annaba) and intersected by State Road N°80. The municipality borders Al-Ruknia, Al-Fajjouj, Houari Boumediene to the south, Madjaz Ammar to the east, and Bouhamdan to the west. According to 2008 population statistics, it has a total population of 16,391 (General Secretariat of the Municipality of Hammam Debbagh) (Fig.2)

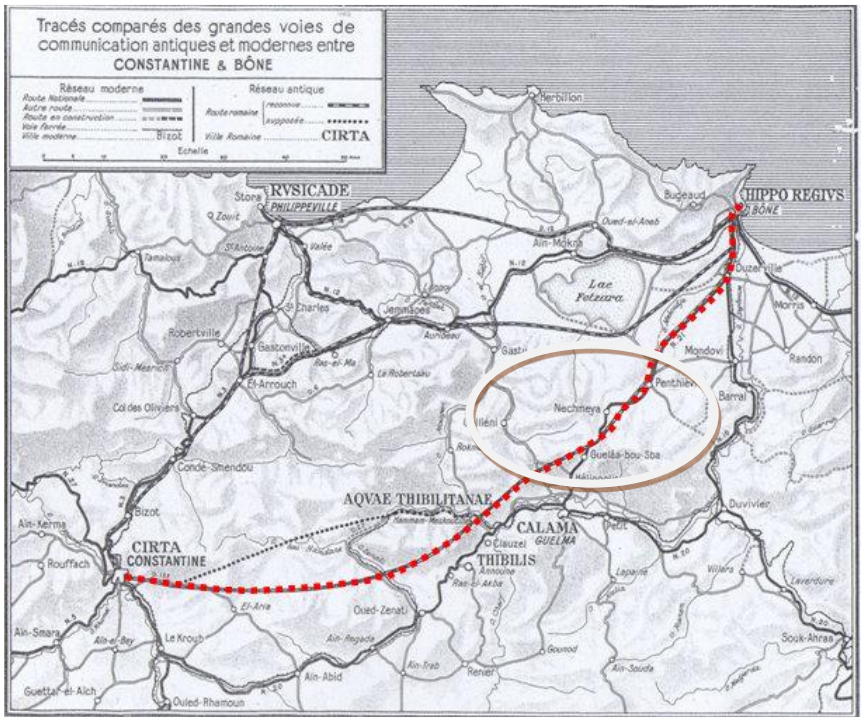


Fig.1 The ancient road network, Salama P.,The Roman Roads of North Afri

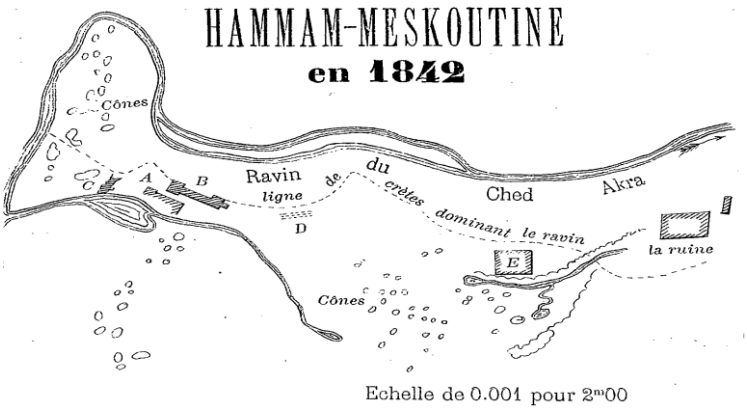


Fig.2 Explanatory Plan of the Archaeological Site of Hammam Debbagh from:
Marty (J) et (J) et RouyerL., Recueil des notices etmémoires de la Sociétéarchéologique de la provincede Constantine1892.

Topography of the Site

The archaeological site of Ad Aquae Thibilitanae lies at an elevation of 314 meters above sea level. Its geographical coordinates are 36°0'16.7" North and 7°28'27.36" East.

The site is distinguished by its varied topography, characterized by a complex hydrological network. This network encompasses the confluence of the Oued Bou Hamdan and Shad Lakhra streams, alongside an abundance of hot and cold springs. The terrain features diverse mountain ranges and expansive plains with fertile agricultural soils. This topographical diversity has rendered the site a natural fortification. The climate is temperate, with rainy winters and hot summers. The region boasts a rich and diverse vegetation cover.

Fig.3 Aerial Image of the Archaeological Site of Hammam Debbagh from Google Earth

Toponymy

During the Roman era, the site was known as Ad Aquae Thibilitanae. Prior to 1989 AD, it was referred to as Hammam al-Meskhoutin under Law 84/09, a name that persisted from the pre-colonial period. Currently, the site is designated as Hammam Debbagh, derived from the adjacent Mount Debbagh (General Secretariat of the Municipality of Hammam Debbagh)

According to German historian Heinrich, the name Hammam Debbagh was originally Thibilis (Heinrich von maltzan, 1979, p.224). The appellation Thibilitanae Aquae translates to "mineral bath" (Marty &Rouyer, 1890, p.232).

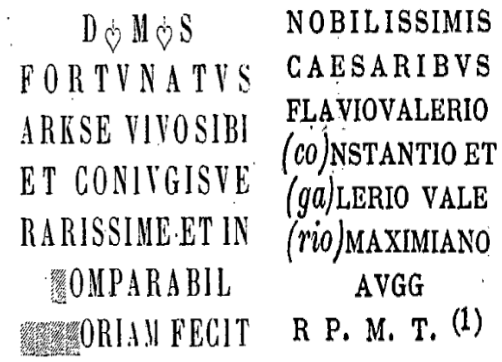
However, scholar Monceaux contends that the name stems from the nearby Roman municipality of Thibilis, positing that this city lent its name to the bathhouse. He further asserts that the city dates back to the Flavian dynasty [4]. Additionally, one researcher has addressed the phonetic and orthographic challenges associated with the French translation of Hammam al-Meskhoutin.

Historical Periods of the City of Ad Aquae Thibilitanae

The city of Ad Aquae Thibilitanae boasts a rich and ancient history, with roots extending back to prehistoric civilizations. Its proximity to the Rkaina region, renowned for its dolmen tombs and hawaneet, further underscores its significance. The discovery of two Punic inscriptions, one adorning a monument, and a Punic wall column capital further attests to the city's Punic heritage. These artifacts were once displayed in the courtyard of the Al-Hammam Foundation alongside other Punic finds and symbols, notably the Tanit motif, often accompanied by palm fronds.

The Roman period is vividly illustrated by the enduring monuments and archaeological relics that grace the site. These include bathing establishments, a water tank, building foundations, and Latin inscriptions. Additionally, a massive wall, situated south of the site and currently known as the Great Wall of China, stands as a testament to Roman engineering prowess. These remnants represent various stages of the Roman era, complemented by a wealth of pottery fragments and polished stones scattered throughout the site, particularly in the Al-Arayes area. Further enriching the Roman legacy are the fountains and funerary furnishings crafted from diverse pottery styles, along with the network of Roman roads that once connected the city.

Fig.4 Punic steles



Funeral Inscription Mile Sign

Knowing the site's Latin name, Ad Aquae Thibilitanae, and its characteristics proved instrumental in facilitating research and information gathering. This name served as a key to unlocking the city's history. By consulting historical sources and references under the ancient name, we were able to delve into the site's archaeological heritage, encompassing various historical periods, its legal and administrative status, and the diverse archaeological remains constituting its fabric, including monuments and artifacts. Additionally, pinpointing the location of these finds proved valuable.

Early works by Gsell, the Archaeological Atlas of Algeria (1902-1911) and Ancient Monuments of Algeria, (Gsell St, 1901, p.239), provided valuable insights into the site. He highlighted the presence of building remnants and a Roman corridor connecting Hippo Regius, Thibilis, and Niniba. He also noted the existence of Libyan inscriptions, dolmen graves, and offered a comprehensive description of the area.

Séjourné's meticulous efforts focused on the Hammam, located on the right bank of Wadi Shdakhra (Papier A, 1879, p.107). He meticulously documented the site, creating a detailed plan under the title Thibilitanae - Hammam Meskhoutin (Aquae). He provided descriptions of the Hammam, including measurements of one of its basins, which was in remarkably good condition upon discovery. He further enriched the study by creating cross-sections of the basin, published in the Hippone Academy journal. Séjourné also described the Hammam's surroundings and offered valuable details about this significant institution.

Bernelle's research encompassed the city's location, its archaeological components, and its fortifications. He meticulously examined the city's layout, its walls, the mile marker discovered within its boundaries, and a wide range of architectural elements, including capitals, columns, mosaic fragments, Roman baths, and other notable monuments and artifacts. Bernelle's contributions extended to the study of the site's fortifications (Gsell St, 1892, p.85).

Investigations by Léon Poulle brought to light inscriptions and a bath in the area, both dating back to the Roman era.

Dr. Marty and Consultant Rouyer conducted a comprehensive study of the baths and nearby landmarks. They meticulously documented these structures, creating a detailed map that clearly indicated the bath facilities. Their research included detailed descriptions of these facilities, accompanied by cross-sections, published in an article titled "Hammam meskhoutine and its surroundings." Marty and Rouyer's work extended to the examination of other structures within the site (Marty &Rouyer, 1892, p.p.207-218).

Dr. Reboud's research encompassed the city itself, its surrounding areas, and the region's Roman antiquities. He meticulously documented several Latin inscriptions and published his findings in an article titled "The Maouna and its foothills" (Reboud, 1885,

p.p. 7-12) in a specialized archaeological journal. Reboud's contributions also included a study of the Guelma region.

Souville's report, "Guelma's collections," highlighted the importance of the Hammam Debbagh site. He meticulously documented its archaeological components, particularly the ancient bathhouse foundation, which serves as the focus of this study. Souville further acknowledged the work of Dr. Fiorini, who authored a memorandum titled "Hammam Meskhoutine" in 1935, providing a comprehensive examination of the site's archaeological components (Souville, 1954, p.p.289).

Legal Status of the Site

The archaeological site of Hammam Debbagh, with its rich array of archaeological components, currently lacks formal protection or classification. While the site itself is considered state property, it has been granted to a private individual. The surrounding area, however, is classified as a national-level natural site since 1993. Despite its archaeological significance, the site remains unclassified as an archaeological site.

The site's architectural components fall under state ownership. As of this writing, the archaeological site remains unprotected by law, even though it is classified as a natural site and subject to the provisions of Law 98-04 on the Protection of National Heritage. According to official information from the Cultural Heritage Service of the Directorate of Culture in the wilaya of Guelma, no monument is registered in the additional inventory list, nor is it classified as an archaeological site. Despite the importance of the site's features, no necessary legal or material measures have been taken to protect it. Recently, the site under study suffered complete destruction due to the construction of a tourist project by a private individual.

Architectural Study

The archaeological site under study is situated at an altitude of 290 meters above sea level, between coordinates 36°07'27.36"N 9°38'27.36"E. It lies 378 meters northeast of the municipality headquarters, on the southern bank of Wadi Shdakhra, near the confluence of this wadi with Wadi Bouhmmadan, close to Hammam Ben Nadji, north of State Road No. 122 leading to the city of Roknia (Photo No. 5).

Fig.7 An aerial photo of the site from Google Earth

Architectural Components

The archaeological site of Hammam Debbagh shares the same fundamental components as ancient Roman baths, with a few notable exceptions. Unlike traditional Roman baths,

the site under study lacks a heating system, as it benefits from a natural supply of hot water reaching temperatures of 95°C. Additionally, a comprehensive bibliographic review and thorough field investigation failed to uncover evidence of extensive ancillary structures associated with the bath complex. This can be attributed to the lack of detailed architectural plans. Nevertheless, a plan of the site was published in a specialized archaeological journal, providing insights into its overall architectural layout.

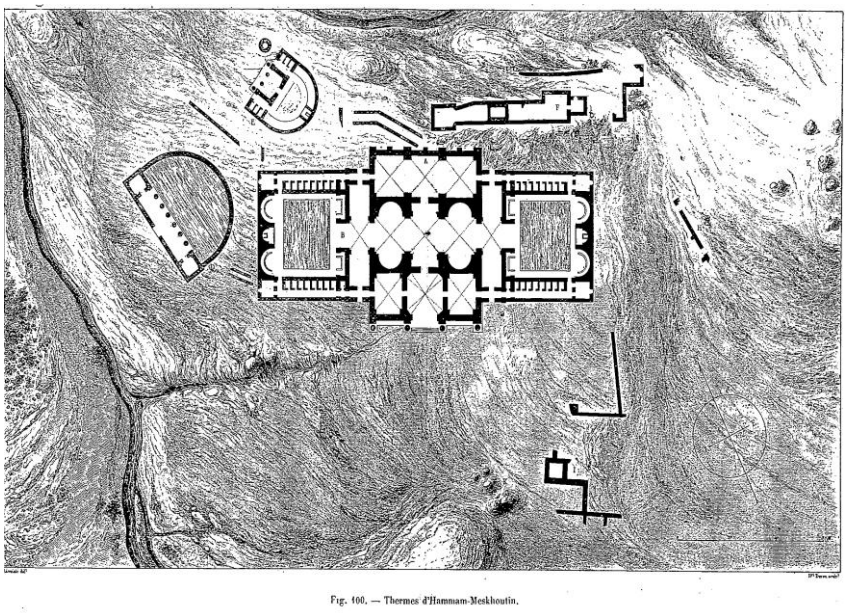


Fig. 100. — Thermes d'Hammam-Meskhoutin.

Fig.8 Scheme of the bathroom, Saladin H., Recherche des antiquités dans le Nord de l'Afrique, conseils aux archéologues et aux voyageurs/ instructions Adressées p.120

The bath complex comprises an entrance that leads to a foyer, which in turn provides access to the various sections of the bath. The interior space consists of eight symmetrical rooms, two of which feature bathtubs and a courtyard. Each room is flanked by two hallways, creating a well-defined circulation pattern. The bath complex encompasses cold, warm, and hot sections, catering to a range of bathing experiences. Additional amenities include a designated relaxation area. Outside the main bath structure, three additional bathtubs are present, two of which are semicircular and one rectangular.

Overall Shape of the Bath Complex

The term "overall shape" refers to the external and internal descriptions of the archaeological remains discovered by both early explorers and the present study.

Several researchers have alluded to the existence of a significant bathhouse at Hammam Debbagh, describing it as a rectangular structure surrounded by various pools of varying shapes. This description aligns with the layout depicted in the plan discovered in a periodical. However, this plan lacks detailed architectural information. The bathhouse features square-shaped basins within its interior, while the external basins exhibit a combination of semicircular (northern and western) and rectangular (eastern) shapes.

External Description

The plan mentioned above provides a basis for describing the bathhouse's exterior, albeit without precise measurements due to the absence of a scale.

A. Front Façade: Situated on the southern side of the bath complex, the front façade features the main entrance, providing direct access to the interior. Two additional symmetrical secondary doors flank the main entrance, allowing entry into different sections of the bathhouse.

B. Rear Façade: Located on the northern side of the bath complex, the rear façade also features two symmetrical secondary doors, enabling access to the various bath sections.

In 1877, Mr. Y. Sejourné undertook the task of documenting a portion of this bathhouse, specifically a swimming pool associated with the ancient Roman baths. However, some researchers have challenged Sejourné's interpretation, suggesting that the structure in question may have served as the headquarters of the Diocese of Eveche rather than a bathhouse .

- Sejourné's meticulously prepared plans were approved for publication by the Hippone Academy, which further supported the existence of a significant Roman bathhouse at the site. While acknowledging that the layout deviated from the traditional cross-shaped design of Roman baths, the academy emphasized the bathhouse's substantial size and strategic location near the confluence of Wadi Shdakhra and Wadi Bouhmmadan.
- Sejourné's documentation revealed a structure measuring 15.50 meters in length and 9.50 meters in width, encompassing four small bathing chambers. This section of the plateau remains intact, preserving drainage basins with façades measuring between 20 and 25 meters. Additionally, a basin measuring 55 meters in length, 7 meters in width at its midpoint, and 9.40 meters at its widest point, is situated within the complex. A lower level basin, located 33.50 meters below the upper basin, covers an area of 373.95 square meters. Spaces between the basin and its associated basins were occupied by workers' dwellings, providing structural support. However, these dwellings lack the characteristics of a typical Roman bathhouse (Papier A, 1879, p.p.107-108).

Despite the debate surrounding Sejourné's interpretation, the bathhouse nature of the structure remains evident. Archaeological investigations have yet to definitively determine whether the bathhouse served as a standalone facility or as part of a larger bathhouse complex, as suggested by the plan created by another researcher (Marty J.,& Rouver L, 1890, p.211) . Several cross-sections of the bathhouse were also produced, and another researcher corroborated Sejourné's findings through his own study and documentation efforts, despite minor discrepancies in certain aspects (Papier A, 1879, p. 112). Remarkably, these plans exhibit a high degree of consistency, despite being produced within a relatively short timeframe.

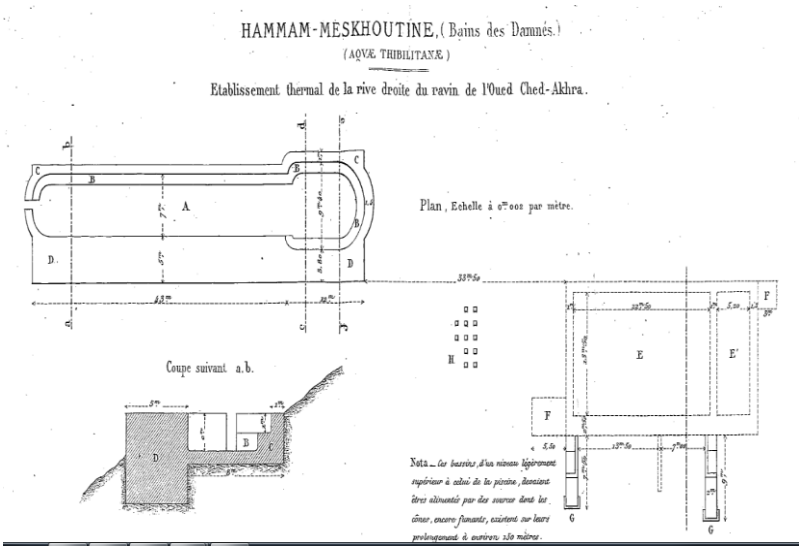


Fig. 9 Lifting plan and clips for the bathroom, Papier, Bulletin de l'Académie d'Hippone, Bone1879

An examination of the plan reveals the presence of remnants of dwellings situated between the basin and the Roman swimming pool. This observation is further substantiated by the remarks accompanying the cross-section of the bath basin. Additionally, the measurements obtained from the cross-sections and surveying work indicate that these remnants are of considerable significance and importance.

The location of the bath on a slope at the edge of the valley necessitated the inclusion of several architectural components beyond those of the bath itself. These components include the wall embedded in the mountain, the wall facing the valley, and the supporting walls, as illustrated in the cross-sections below pertaining to the swimming pool.

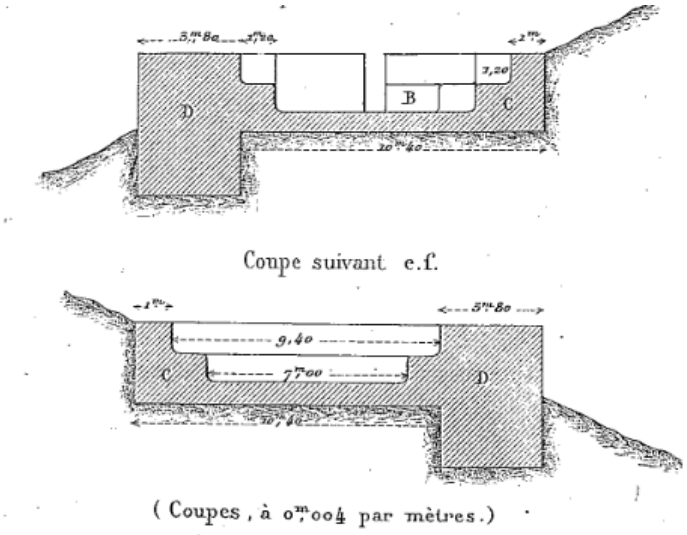


Fig. 10 Cross-section: Papier, Bulletin de l'Académie d'Hippone, Bone1879

Through field research and a comprehensive survey process, we identified a remnant of the site, an apse, located within the vicinity of the Roman bath complex. Due to ongoing construction activities in the surrounding area, coupled with the presence of debris and human waste, we were unable to conduct a detailed survey of the apse. However, we were able to gather some basic measurements.

The apse measures 12.14 centimeters in length from its western edge and 9.22 centimeters in width on its northern side. Its height stands at approximately 3.10 centimeters. Two irregular openings are present on the apse's western side. The northern opening measures 43 centimeters in height and 46 centimeters in length, while the southern opening measures 1.22 meters in length, 1.10 meters in height, and 40 centimeters in thickness. The distance between these two openings is 3.86 meters, and the apse's width on its southern side is 6 meters.

In close proximity to the apse, on the northeastern side, lies a buried swimming pool. The pool has sustained damage on its eastern side due to nearby construction activities. The pool's dimensions are as follows : depth – 1.20 meters, width – 9.20 meters. The pool's length remains undetermined due to its partial burial under the soil and the encroachment of construction work, which occurred under the supervision of the authorities.

The northern wall of the pool measures 1.60 meters in thickness, while the southern wall measures 2.50 meters in thickness. The pool's interior is filled with approximately 30 centimeters of silt. The floor preparation layers measure 22 centimeters in thickness, and the floor mortar, which is a pink mortar composed of gypsum, sand, and pottery fragments, ranges in thickness from 0 to 4 centimeters. The water-insulating mortar has a thickness ranging from 0.05 to 1.0 millimeter. Additionally, a cistern, of which only a small corner remains, is situated to the south of the pool.

Fig. 11 The remaining part of the swimming pool

2-Internal description.

According to the researchers' accounts, the interior of the bath complex features a house exit measuring 3 meters in width and with walls 40 centimeters thick. A courtyard measuring 25 meters in length occupies the central space, within which a cistern stands, capable of holding approximately 80 hectoliters of water. Encircling the courtyard is a wall that extends 5 meters from the exterior, culminating in a rocky feature. A diagram of the bath complex appears in "The Atlas of Scientific Exploration of Algeria," issue number 169, published in 1850. This diagram, with some modifications, reflects the state of the complex as observed by researcher Grellois. Grellois provided a valuable description of the current structure, which presents challenges in terms of precise documentation. He

also offered an account of the swimming pool, which had been previously studied and surveyed by Papier, and provided the measurements mentioned earlier.

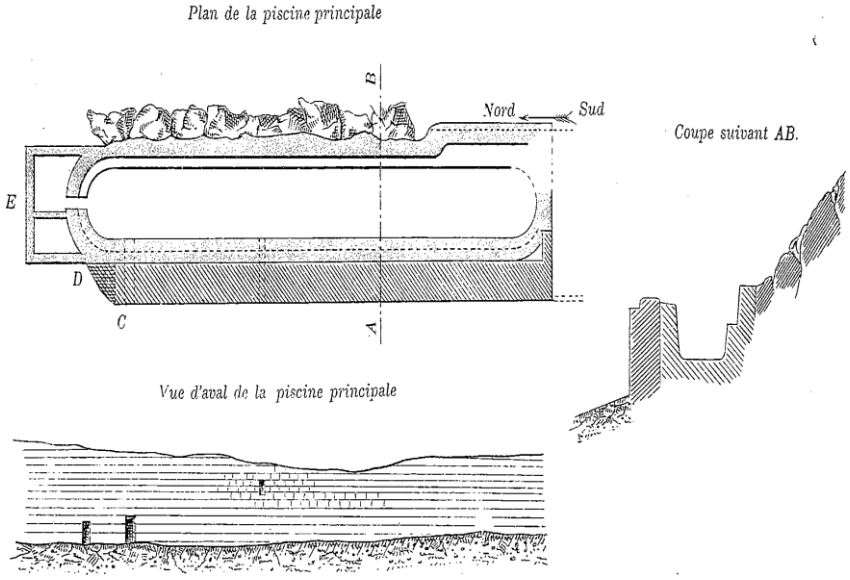


Fig. 12 Main pool plan for bathroom: Marty (J) et Rouyer (L)
Recueil des notices et mémoires de la Société archéologique de la province de Constantine189

A thorough survey of the swimming pool, conducted by one of the researchers, reveals its remarkable beauty and intricate design. The pool comprises three distinct basins, each with its unique characteristics. The central basin, of rectangular shape, features a semicircular end, adding an elegant touch to its overall form. On the northern side of this rectangular basin, a trapezoidal basin adjoins, providing an intriguing contrast in geometry. The southeastern side of the complex is home to a series of annexes, while the western side boasts a well-maintained and inviting surrounding area.

An examination of the plan published by an archaeological researcher in the periodical (Saladin H, 1890, p.120) "Recherche des antiquités dans le Nord de l'Afrique" unveils the bathhouse's adherence to the principle of symmetry. This meticulous attention to balance and harmony is evident throughout the structure's layout and architectural elements. The bathhouse consists of eight distinct sections, each serving a specific function.

The bathhouse's main entrance, situated on the southern side, is of considerable width, emphasizing its importance as the primary access point. Upon entering, visitors are greeted by a small hall, a charming transitional space that connects them to the various sections of the bathhouse. This central hall serves as a hub, providing easy access to all the bathhouse's amenities. Surrounding the central hall lie three symmetrical sections, each mirroring the other in their arrangement and design. The eastern and western sections feature identical layouts, while the central section stands out with its unique tripartite division.

The central section, the heart of the bathhouse, comprises three distinct spaces: a primary space flanked by two symmetrical spaces. These interconnected spaces provide a sense of flow and continuity, allowing bathhouse patrons to navigate seamlessly between the various areas. Flanking the eastern and western sections are two symmetrical courtyards, each offering a tranquil outdoor retreat. These courtyards

feature four symmetrical secondary doors, providing multiple access points for entering and exiting the bathhouse. Each courtyard boasts a main door and two secondary doors, adding to the overall symmetry of the design.

Within each courtyard, bathhouse patrons can find two hallways and bathtubs, providing ample space for relaxation and refreshment. The presence of these outdoor amenities further enhances the bathhouse's appeal as a place of rejuvenation and well-being.

The northern section of the bathhouse comprises three symmetrical rooms, each accessible via a single entrance from the central section. These rooms, designed for quiet contemplation and personal hygiene, contribute to the bathhouse's overall sense of tranquility.

Historical accounts indicate that the bathhouse was adorned with exquisite mosaics, showcasing the artistic craftsmanship of the era. Additionally, statues unearthed during excavations hint at the bathhouse's cultural significance and the presence of artistic traditions within the community.

The bathhouse stands out as a remarkable architectural gem, distinguished by its striking rectangular plan and unwavering adherence to symmetry. Its unique design, devoid of a traditional heating system (Hypocauste), further underscores its distinctive character.

The bathhouse's facade, adorned with a main door and two secondary doors, exudes elegance and invites visitors to explore its interior treasures. Surrounding the bathhouse are beautiful basins and swimming pools, adding to its visual appeal and enhancing its recreational offerings.

The bathhouse's location, perched atop a slope where Oued Chdakhra and Oued Bou Hamdan converge, provides breathtaking panoramic views of the surrounding city. This strategic position not only enhances the bathhouse's aesthetic appeal but also serves as a reminder of its connection to the city's natural landscape and historical

II-Building Materials.

1-Stones.

A thorough examination of the site revealed that the primary building material employed in the construction of this landmark was stone. The vast majority of these stones were sourced locally, with only a small fraction originating from external sources.

Types of Stones

Upon closer inspection, we identified two main types of stones utilized in the construction of the landmark:

1. **Natural Stones:** These stones remain in their original state, having undergone minimal or no modification by human hands (Adam J.P., 1984, p.287).
2. **Prepared Stones:** These stones have been subjected to various processing techniques, such as polishing, shaping, and carving, to enhance their form and functionality. Prepared stones were primarily employed for constructing walls, particularly as supports, foundations, and cornerstones.

Fig. 13 Prepared stones scattered around the bathroom.

2-Debesh Stones

In some of the site's structures, a type of stone known as "debesh" is employed. These stones come in various sizes, ranging from small to medium, and are created by crushing hard rocks of diverse origins. Debash stones can be fashioned into regular shapes, typically square or rectangular, or they can be left in their irregular, angular, or random forms. They were primarily used as a filling material (Adam J.P., 1984, p.267).

Fig. 14 Rubber used in construction

3-Mortar.

A. Hydraulic Mortar

The primary function of this hydraulic mortar is its impermeability to water, rendering it non-porous. This type of mortar was discovered in one of the basins, where it coated both the floor and sides, as well as in one of the bathhouse's associated tanks.

B. Tile Mortar

This type of mortar, employed in the construction of heated hall floors, was identified in the remaining dome of the study site. Its purpose is to enhance and retain heat. The mortar is composed of a lime mixture with a high proportion of crushed brick, resulting in a deep bluish-pink hue. Due to the extensive damage caused by human activities, such as the setting of fires within the structure, it is challenging to discern this mortar within the site.

Fig. 15 Mortar used in construction

B- Brick

The oldest artificial material known to humankind, is derived from clay through a process of shaping, drying, or firing. This versatile material can be categorized into two primary types:

1. **Sun-dried Brick:** These bricks are formed by shaping clay and allowing them to dry under the sun's heat. While less durable than fired bricks, they were commonly employed in ancient construction due to their ease of production.
2. **Fired Brick:** To enhance their strength and durability, sun-dried bricks are subjected to intense heat in a kiln. The resulting fired bricks are more resistant to weathering and structural stresses, making them ideal for load-bearing applications.

At the study site, we encountered both sun-dried and fired bricks, primarily in the remaining dome of the bathhouse, certain sections of the basin and tank, and scattered around the bath's perimeter. Additionally, fragments of bricks were found embedded within the mortar layers of the floors. The majority of the bricks discovered at the site measured 20 cm x 20 cm. We also came across brick tiles, but due to their incorporation within mortar and rubble, we were unable to obtain precise measurements.

Fig. 16 Brick used in construction

C- Marble

During excavation work near the bathhouse, particularly in front of the newly uncovered basin, numerous gray marble fragments were unearthed. Unfortunately, most of these fragments were damaged.

D- Pottery

Pottery, a type of fired clay composed of mineral materials, was abundantly present throughout the bathhouse. It served various purposes, including the construction of water channels and the provision of heating for the bath's various sections, particularly during the winter months. Pottery fragments were found embedded within the remaining bathhouse walls, and several shards of pottery pipes were discovered scattered around the bathhouse, particularly near the basin.

III- Construction Techniques.

A. Uncoursed Masonry (Opus Incertum)

This irregular construction technique utilizes small, unhewn stones of varying shapes and sizes, bound together by mortar (Adam J.P., 1984, p.49). We encountered this technique in the remaining dome of the monument.

B. Squared Masonry (Opus Quadratum)

Widely employed in Roman cities, particularly those across North Africa, squared masonry involves the use of precisely cut stones of varying dimensions (Laurent J.-M., 1994, p.126) (rectangular and square), tailored to their intended placement. This technique features large, square-cornered stones laid without mortar, as evidenced in the majority of the monument's surviving structures. The previously completed plans, of which only scattered stones remain near the monument's site, further illustrate this technique's application.

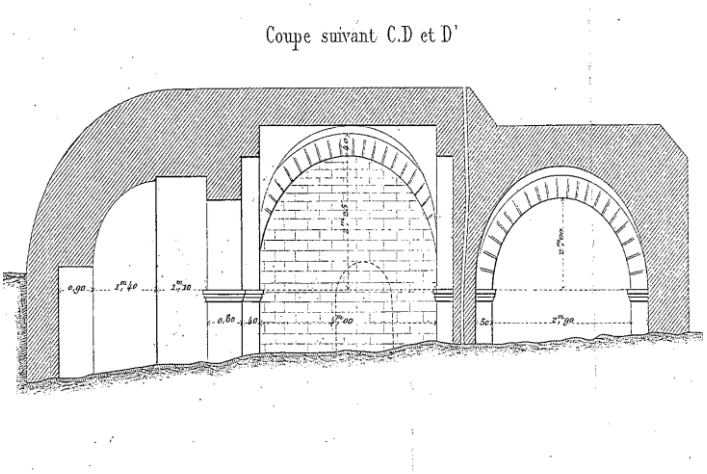


Fig. 17 Square work

C. Concrete Work (Opus Caementicium)

Concrete work is a composite construction technique that combines stone fragments or fired brick elements with mortar, creating a durable and cohesive structure. The mortar serves as a binder, alternating layers of these materials to enhance the wall's strength. This technique is often employed as an internal core or wall support, molded within a wooden form.

The ease, economy, and solidity of concrete work made it a popular choice for constructing apses and basin walls (Adam J.-P, 1984, p.126) . We observed this technique in the remaining dome of the monument and the basin's northern wall.

D. Brickwork (Opus Testaceum)

Brickwork, a construction technique utilizing exclusively fired Roman bricks, often shares similarities with lattricum, which differs in its use of jar bricks and fired bricks (Dessales H., 2013, p.04). The ground portion of the monument's surviving dome was constructed using this technique.

Conclusion:

Our field study of the site revealed several significant challenges, primarily reflected in the deteriorated conditions of the discovered structures and the wide scattering of their remains.

These difficulties were compounded by the dispersed nature of these remnants and the unclear spatial relationships between them, which hindered our ability to accurately identify them connections. Although we uncovered a pool and an adjacent domed structure, determining Our field study of the site revealed several significant challenges, primarily reflected in the deteriorated conditions of the discovered structures and the wide scattering of their remains.

These difficulties were compounded by the dispersed nature of these remnants and the unclear spatial relationships between them, which hindered our ability to accurately identify them connections. Although we uncovered a pool and an adjacent domed structure, determining their function or the section to which they belonged remained uncertain. To achieve acomprehensive understanding of the site and accurately identify its various sections and them functions, systematic and in-depth excavations of the bath complex and its surroundings are essentials. Only through such meticulous investigation can we reconstruct the full historical context of the site and reliably assess its archaeological significance.

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