Roman architecture plays an important role in terms of variety of structures and variety of materials and means by which they were constructed. The Roman theatre of Jebleh in Syria is one of the unknown masterpieces of Roman architecture in the Middle East that deserves our attention.

Since 1999 the Syro-Belgian mission carried out analytical investigations at the Roman theatre of Jebleh in Syria. The project was started at the behest of Prof. Dr. Jamal Al Ahmar, Director-General of Antiquities and Museums of Syria, in agreement with Mr. Jamal Haidar, Director of the Archaeological Museum of Lattakia, engineer Fatima Ibrahim is the Director of the Archaeological site of the Roman theatre. The Belgian team is under the responsibility of Prof. Karel Van Lerberghe, professor in Assyriology at the K.U.Leuven; Belgium. The team is made up by a number of researchers, technicians and students from Syria and from Belgium. Three missions took place to gather data on: archive research, archaeological research and detailed architectural analysis (survey of remains, construction and structural analysis and survey of weathering forms).

The research project aims the study of the building in view of its conservation and its integration in the city of Jebleh. Part of the analysis of the theatre is dealing with a thorough study including all its architectural features. For this paper the analysis of the construction made of massive masonry walls, vaults and arches are explained and particular details of the construction are presented.

**General History of the Theatre**

Some authors state that the theatre was built by the emperor Justinianus, 527–565 AD (Jacquot 1927), others state that it was built by the emperorSeptimius Severus, 193–211 AD. From the architectural details and from the first results of the excavations we are considered that the theatre was probably built during the Severian dynasty, 193–235 AD, probably in the first half of the 3rd century AD. This question deserves more attention and future research. Nevertheless the Roman theatre was situated at the centre of a Roman settlement, the city of Gabala.

In the years of 1098–1285 the crusaders occupied the city (Jacquot 1927) and in that time the theatre was transformed into a fortification, like the Bosra theatre in south of Syria. Many authors refer to this transformation as G.Rey after is trip in 1859 (1871: 215), and some archaeological evidences prove it as well. Many are the travellers that visited Jebleh, Arabic travellers as Yakut al-hamoi in 1225 and Ibn Battuta in the 14th century, and especially European travellers as H. Maundrell in 1698, R. Pococke (1745: 199), Louis de Clercq (1881: 36) and G.Rey (1871) in 1859, Max Van Berchemand and Edmond Fatio in 1895 (1914: 94–97). From their travels descriptions,
important information was collected about the theatre. The oldest pictures known from the theatre are from 1859 or 1860 taken by Louis De Clercq during his trip to Orient (De Clercq, 1881: 36). One can see that the cavea structure was still complete for the first and second maenianum and that all the openings of the main façade of the cavea are completely closed. This filling in of the openings is probably what remains of the late fortification built around the theatre. Comparing the photographs and the nowadays situation and referring to literature we can conclude that many destructions happened to the theatre in the span of time 1860–1930. These destructions, half of the cavea structure, were probably due to the fact that the theatre has been used as an open quarry to the Jebleh citizens. Besides, in the end of the nineteenth century and during the first half of the twentieth century, the substructures were used for shops and animal stable and at the same time, houses were built on top of the cavea remains (Jacquot, 1927). In 1949 the General Direction of Antiquities and Museums started a full excavation campaign at the roman theatre (Frézouls, 1952). In 1962–1964 the houses were demolished.

The city of Jebleh is situated in an earthquake area; a few strong earthquakes known: 476, 859 and 1171 AD. At that moment heavy damages were reported in Jebleh. Nevertheless we still have no information about their consequences to the theatre and implications on further transformations and/or deformations. Furthermore, on the outside structure, no apparent deformations by an earthquake are recognisable.

ANALYSIS OF THE EXISTING STRUCTURE

«... The architects of the High Empire reworked the old designs with great virtuosity into varied ensembles of fresh power. But, more and more, they turned from them toward complete enclosure of space by curved surfaces. Confident mastery of their materials made them free to throw great vaults over space and swing great curves around it. Experience taught them to conceal structural support in the body of structural fabric... » (Brown 1991, 33).
The theatre situated in the centre of the town of J eb leh, is built on a flat land and is orientated to the North. The structure is built in *opus quadratum* with blocks of local sandy-limestone, Figure 1.

Originally, the external façade of the *cavea* was a half circled ring wall where one could see a rhythm of doors, circled windows and buttresses, corresponding to the inside partition of the *cavea* sub-structure. Dividing the levels a profile was running all around the wall and the buttresses, Figure 6, 7. Nowadays on the main façade one can still perceive part of the half circle ring wall. As the street level changed the level of the in-side gallery changed also, around 3,30 meters higher than the original level of the gallery. Original doors and windows are not anymore clearly readable. The lintels of the doors were broken and windows were transformed into doors. Nowadays the existing part of the façade corresponds to the level of the windows, Figure 4.

The façade openings give access to the main gallery with a new travertine slab pavement, built in 1988, and a vaulted ceiling. The compartments in between the radial walls connect the main gallery with a second vaulted gallery. From this gallery is still possible to perceive the starting of another set of *scalaea* to establish the connection to the third level of the *cavea*, Figure 3. The original pavement of the third gallery still exists.

The still standing part of the original theatre corresponds to the *cavea* with its central part relatively well preserved, Figure 2. The *ima cavea* is complete and half of the *media cavea* still exists. Some elements of the *summa cavea* are still in-situ. The three *praecinctium* are still partially visible. The structural system to support the *gradus* is very similar with the structural system of the Bosra Theatre, as well as of some Jordanian theatres (Frézouls, 1952). The relation of the measurements of the *gradus* (height = 0.39 m, depth = 0.65 m, larger = 0.90 m) gives the slope of the *maenianum*, Figure 4, 6. The first arch supporting the second and third *maenianum* is closed with carved stones composing the back wall

![General view of the cavea. (Jeb leh 2000)](image)
of the *praecinctium*, and closing the *vomitoria*. The internal ambulatory was only connected with the *praecinctium* by four doors, Figure 5. Nowadays one of these doors is complete and the second is partially visible.

The first supporting arch of the *ima cavea* is also closed with a wall composing a reduced *praecinctium* of 1.40 m high. From the first till the fifth *gradus*, rubble stone and mortar established the foundation. Five groups of small stairs connect the orchestra to the *ima cavea*. At the *ima cavea* and going through the *media cavea*, nine groups of radial *scalaria* are still visible. Concerning the number of *gradi*, the 1st *maenianum* has 13 existing *gradi*, the 2nd *maeniana* has 11 existing *gradi* and the 3rd *maeniana* only part of three *gradi* are preserved.

While studying the *membra disjecta* of the orchestra a large amount of carved stone blocks that compose four stone parapets were recognized. Two of the latter close the extremities of the *ima cavea*; the other two are axial and are connected to the axial *scalaria* separating the two central *cunei*.

The *frons pulpitum* exists in its half, with 1.40 m height and presents a succession of rectangular and half circled niches.
The nowadays scene building is only existing at the foundations level. Many are the *membra disjecta* existing from the *frons scaenae*. With the survey of the blocks two cornices and an architrave with a radial shape were encountered bringing up the idea of a possible central circular niche. Three different types of columns with unfluted and monolithic shafts can be identified: the ones in grey granite by a height of 4.72 m and 0.65 m to 0.56 m diameter, those in rose and red granite with undefined height and diameter of 0.80 m. Corinthian capitals and Attic-ionic bases were encountered having dimensions corresponding with the columns. Concerning the entablature two different dimensions referring to two different levels of the portico exist for each typology. The area of the scene building is still not completely excavated. All over the site one can find a large amount of *membra*.
**MATERIALS**

Normally a Roman builder looks for certain mechanical and aesthetical qualities from stone, and this qualifies the Romans not only to select local materials but also to import stone, sometimes from considerable distances (Adam 1994, 20). As usually, only one type of stone was available in the vicinity of the ancient town of Galaba (Jebleh). Its identification was relatively straightforward. Likewise, the structure of the theatre is built in local sandy-limestone, apart from the *frons* _pulpitum_, the *gradus* and the *praecinctium* pavement slabs that are made in limestone. The quarries of the sandy limestone were localized in the vicinity of the city of Gabala: one is situated in Shkaifat, 10 km to the north side of Gabala, and the other is situated in Arab El-Mulk, 8 km to the south. The quarries of limestone were situated in the mountains.

The identification of the imported stones obliges to a more complex investigation into geographical origins. The scene building was built in sandy-limestone. The profiled *socle* of the portico of the *frons* _scaenae_ was in sandy-limestone, the colonnade in grey and red granite from Aswan, and the column bases, capitals and entablature in white marble. The origin of the white marble is still unknown; nevertheless the type of marble is similar to the Proconnesus marble, white marble as well white-black veined marble.

**WALLS**

If in Rome the new building material, the Roman concrete, was used extensively, the architects of the eastern provinces were slow to adopt the new building methods (Ward-Perkins 1977). The reasons are not only tradition but also because they mostly lacked the volcanic sands, which gave the concrete of Central Italy its unique strength. Their mortar fell short of the quality of its Italian counterparts, and in many areas of the east dressed stone remained the preferred medium for the walls and even the vaults of such buildings as theatres (Ward-Perkins 1977). The structure of the Jebleh Roman theatre is completely built in stone. The main structure of the theatre is built in *opus quadratum*, built with rectangular carved blocks made up of local sandy-limestone, arranged in horizontal courses, or ashlars, and with dry joints. *Opus quadratum* is the first development that earns the designation of fine architecture. This is a form, which could give the best stability to the elements of a structure and is exclusively composed by horizontal and vertical lines. The appearance of facings made of rectangular stone blocks can differ quite markedly, depending on a number of factors one of the most important is the arrangement of
the stones in the wall, determining the pattern of the joints. The walls of the theatre, internal and external, follow always the same pattern of joints and the same method of construction through its entire thickness, Figure 6, 7. By the fact that the walls of the theatre are thick—the external façade wall of the cavea has 3 m thicknesses average and the interior walls 1.80 m thickness—it was necessary to alternate one course of bonding block laid normally with a course of head-on bonding blocks and stretchers, Figure 1.

**Arches and Vaults**

The Roman theatre of Jebieh is a complex system of walls, arches and vaulted spaces. The construction forms of the cavea are characterised by the intersection of the semi-circular barrel vaulted galleries, ring walls, with the radial segments, radial walls. The segments are on a constant rhythm of radial walls supporting barrel-vaulted rooms and ascending stepped vaults depending of the internal vertical circulation and of the gradus, Figure 3. The intersections of the semi-circular walls with the radial segments reveal interesting features concerning the original construction methods. By the fact that the cavea structure has a constant rhythm made up of radial walls and compartments it was decided to concentrate the analysis on segments type, Figure 4. Longitudinal sections from the main façade through the main gallery, along the compartments, cutting the ima cavea and reaching the pulpitum were made. Segment 13.13 — section AA’ — characterize the access to the ima and media cavea. Segment 16.16 — section BB’ — characterize the access to the summa cavea. Along both segments detailed cross-sections were made to understand the construction of the vaults and arches as well to verify the stability and deformation of the structure. The study of the construction methods (different stages of construction, why different types of arches were used) gives essential knowledge for a good restoration proposal. This study is still going on; therefore a first analysis is presented.

**Arches**

All the arches of the theatre are voussoir arches with radiating joints and working at compression. Each vousoir, arch stone, has a trapezoidal section. An important feature is the fact that the extrados and the intrados of the arches are always parallel without any continuation in between the stone arch and the wall. The voussoir arch has the advantage of distributing sideways the loads carried; the loads slide on to the extrados. This type of arch is very useful in networks of large masses of masonry which distributes the thrust to strong points arranged one above another vertically. The arches of the sub-structures of the cavea are always making the connection between the radial vaulted galleries and the radial vaulted compartments; they have a rise of 1.90 m and a total of 17 voussoirs.

At the main façade of the cavea a voussoir arch with 1.10 m rise and 11 voussoirs compose the windows. The doors have as well an arched impost opening, Figure 5. The stone lintel of the door is relieved by the arch, which acts, as a «discharge» above the straight lintel. Very unusual is the arches with a right angle at the extrados of the superior voussoirs so that they fit into their respective courses. This situation happens to make the correction between the superior voussoir of the arch and the cornice.

No marks were found at the spring of the arches, from the façade arches and from the interior arches, that let us suppose the type of centring for its construction. The centring, probably made of at least two arcs of a circle made of wood, joined by a semi-cylindrical base with the moulding of the arch, was probably supported directly on the ground using wooden posts.

**Vaults**

The Romans were the first builders in Europe to appreciate the advantages of the arch and of the vault (Robertson 1964). It is therefore convenient at this point to remember a remarkable example of roman stone vaulting, the so called temple of Diana at Nimes, and to remember the remarkable system of stone roofing found in Syrian building of the Imperial age.

When speaking about the vaults of the Jebieh theatre it’s important to keep in mind that they are all built in cut stone, dry-jointed and un-mortared. Besides, vaults are individual elements not integrated into the enclosure walls. The general plan of the cavea is a half circle, composed by two circular galleries intersected by nineteen segments and
compartments. Different types of vaults enclosed de various spaces, Figure 8. Five types of vaults were encountered: normal barrel vault (this typology was not studied because it was only existing at the aditus, nowadays in ruins); circular barrel vault, radial barrel vault, barrel sloping vault and stepped vault.

Circular Barrel Vault

The circular galleries, one at the ground level and one at the second level are vaulted. The ground level vaulted gallery, main gallery, has 3.80 m large and a double height of 9.50 m. The vaulted gallery of the second level has 2.50 m large and a single height of 3.67 m. The interesting feature of both galleries is that its section is a perfect half circle, Figure 4, 5, 6.

The builders of the theatre skipped the risk of intersections of the vault and the lateral voussoir arches. At the main gallery none of the voussoir arches of the ring walls intersect the vault. It might be thought that the Roman builders, who were familiar with arches and vaults in stone blocks construction, would have overcome this difficult problem by the cross-vault, but this was not the case. On the contrary, the spring of the circular barrel vault is always higher than the keystone of the arches. For the second gallery the situation has more particularities but it will be discussed further.

All along the circular vault, at the level of the spring, a projecting profile with a decorative value as cornice let us suppose that for the construction of the vault the centring was probably supported at the level

Radial Barrel Vault

We gave the name of radial barrel vault to the vaults enclosing the radial compartments between the two galleries. They compose one of the most interesting vaults of the Roman theatre of Jebleh. The spring of the vault is a horizontal line as well as the crown of the vault. However, the span at the starting is larger than the span of the end of the vault. For this reason the cross-section of the vault at the starting is a three-centred arch and at the end is a semi-circular arch, Figure 9. To keep the homogeneity of the joints pattern, that is always horizontal, the number of voussoir changes in both cross-sections: 21 voussoirs for the starting cross-section and 19 for the end cross-section.

For these types of vaults no projecting profile existed as for the gallery vault, yet five squared holes in each sidewalls let us rise the hypothesis of a structure crossing the open space of the compartment providing a robust support for the centring, Figure 4.

Barrel-Sloping vault

The vaulting of the compartments for the stairs leading to the third level of the cavea has an inclined
The fact that the second gallery has small dimensions posed a problem to the builders—the intersection of the two vaults. A cross-vault of stone cutting is not an usual solution for roman builders. The only monument in the Italian peninsula with a cross-vault of stone is the Tomb of Theodoric, in Ravenna built in 530 (Adam, 1994). Moreover, in the case of Jebleh the two barrel vaults meet at different levels, one can only speak of intersection and not about cross-vault. In an attempt to avoid this intersection the starting arch of the barrel sloping vault was slightly inclined to change the level of the spring, Figure 11. As a result, the section of the starting arch of the vault is a parabolic or raised arch.

**Stepped vault**

The stepped vaults correspond to the sub-structures of the *maenianum*, that support each *gradus*, Figure 12, 13, and to the substructures of the stairs leading to the...
Figure 11
Graphic survey. Transversal section BB', Segment 16.16. Cross-section BB/B12 corresponds with the section of the starting arch of the barrel-sloping vault. (Tarcis Stevens, 2001)

Figure 12
Stepped vault of sub-structure of the 1st maenianum. (Jebleh)

third level of the cavea Figure 14. The vault is formed by an ascending succession of arches developing a stepped vault. Each arch is a voussoir arch that works structurally independent from each other's. This type of vault is very common in the theatres of the region; the best known is in the Bosra theatre.

**FINAL REMARKS**

The results of the ongoing work at the roman theatre of Jebleh are convincing evidences of the importance of the theatre and of the potential of the remains. The technical properties and aesthetical characteristics of the theatre confirm that the theatre is one of the masterpieces of roman architecture in the Middle East. The knowledge gathered justifies the
preservation of the site representing a fundamental step for the global project of restoration and site presentation.

**NOTES**

1. Belgium Programme IPA 5/14, initiated by the Belgian State, prime Minister’s Office, Science Policy Programme.
2. One of the first woks of *Opus Quadratum* is the Servian wall, for a long time attributed to the king Servius Tullius, the six king of Rome (578-535), but most certainly built after the taking of Rome by the Gaul’s in 390BC (Adam 1994, 106).
3. «... Artistically and practically, the integration of a circular shape into a wall created some problems for the stone masons who were confronted with cutting blocks with angled outlines before fitting them onto the extrados of the voussoir. This method of fitting is, however, the most functional, as in this way the arch remains an independent structure from the wall ...» (Adam 1994, 168).
4. This justified the fact that all the doors lintels were removed in the past without creating structural problems to the façade.
5. «... As there is so far no representation in the Roman pictorial record of the building of an arch with centring, no model can be put forward as a precise picture. The only justifiable assumption is that the technique is in every respect comparable to that shown in medieval pictures ...» (Adam, 1994, 175).
7. The date of the Temple of Diana is probably the second century AD.
8. Special group of construction forms extend into the Christian architecture of the fifth, sixth and seventh centuries.

**REFERENCE LIST**


