

## The Alignment to Solstice of the Temple of the Sun at Gerasa

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Gerasa was a town founded under the rule of the Macedonian Empire. Planned having a regular layout, a large part of it has buildings and streets aligned along the sunrise on winter solstice. Here we discuss in particular the temple of the Sun, today known as the temple of Artemis.

Jerash, the capital of the Jerash Governorate situated in the north of Jordan, is the site of the ruins of the Greco-Roman Gerasa. Inscriptions from the site and literary sources tell us that the city was founded by Alexander the Great or his general Perdiccas, who settled aged Macedonian soldiers there [1]. Then, for this town, it was used the name "geras" which means "old age" in Ancient Greek. The foundation took place during the spring of 331 BC, when Alexander left the Egypt for Mesopotamia [1]. Planned having a regular layout, Gerasa seem oriented along the sunrise direction on winter solstice. Before showing its astronomical orientation, let us see in detail its town planning as discussed in [2].

We find information about Gerasa in the fundamental book on the Ancient Town-Planning, written by Francis Haverfield and published in 1913 [2]. The town is discussed in the fourth chapter, on the Greek town-planning of the Macedonian age, 330-130 BC. In fact, Gerasa, such as many other towns of the East, were not founded by the Romans but had origin under the rule of the Macedonian Empire. We read in [2], that the "Macedonian age brought with it, if not a new, at least a more systematic, method of town-planning. That was the age when Alexander and his Macedonian army conquered the East and his successors for several generations ruled over western Asia, when Macedonians and Greeks alike flocked into the newly-opened world and Graeco-Macedonian cities were planted in bewildering numbers throughout its length and breadth. Most of these cities sprang up full-grown; not seldom their first citizens were the discharged Macedonian soldiery of the armies of Alexander and his successors" [2]. In fact, this was the origin of Gerasa, for settling aged Macedonian soldiers.



Figure 1: Gerasa in Haverfield's book [2].



Figure 2: Gerasa in Wikimapia.

Let us see how Haverfield is specifically discussing Gerasa. "Further south, on the edge of the Haurân, stood the town of Gerasa. This too, like Apamea, was built by the Macedonians and flourished not only in their days but during the following Roman age. ... Its streets resembled those of Apamea. A colonnaded highway ran straight through from north to south; two other streets crossed at right angles, and its chief public buildings, the Temple of the Sun and three other temples, two theatres and two public baths, stood near these three streets (fig. 10 of [2] here given in the Figure 1). Again the evidence proves rectangular town-planning in broad outline; excavation alone can tell the rest. In the towns just described a distinctive feature is the 'chess-board' pattern of streets and rectangular house-blocks." [2]

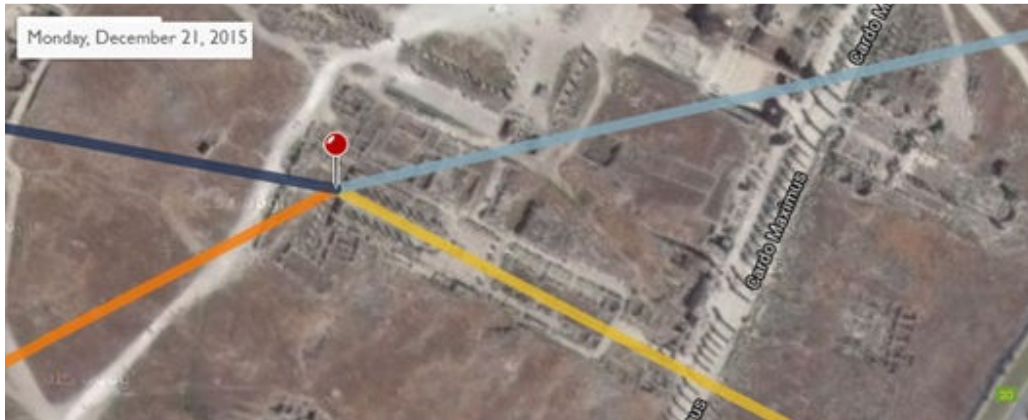


Figure 3: This image shows a part of Gerasa. In this image (a snapshot of the Photographer's Ephemeris result) the yellow and orange lines are the sunrise and sunset azimuths, here evaluated on the winter solstice (the blue lines represent the moonrise and moonset azimuths). The monuments are perpendicular to the Cardo, but they are also aligned along the sunrise azimuth on winter solstice.



Figure 4: A colonnaded decumanus of Gerasa, oriented along sunrise on solstice.



Figure 5: The southern decumanus has a slightly different orientation. This is probably due to the slope of this area.

As we can see from the Figures 2-5, the colonnaded *Cardo Maximus* of Gerasa is oriented NNE. In the Figure 3, we see the northern part of the town. In the image (a snapshot of the Photographer's Ephemeris result) the yellow and orange lines are the sunrise and sunset azimuths, evaluated on the winter solstice. The monuments are perpendicular to the *Cardo*, but they are also aligned along the sunrise azimuth on winter solstice. Therefore, we have a colonnaded *decumanus*, as shown by the Figure 4, which has a solstitial orientation. In the southern part of the town, we find a *decumanus* (Figure 5) having a slightly different orientation, probably due to the slope of this area.

Let us note that Haverfield is telling that Gerasa had a "Temple of the Sun". As we can see from an old picture (Courtesy Library of Congress, <http://www.loc.gov/pictures/item/2004670442/>), the Temple of the Sun in the book of Haverfield is today known as the temple of Artemis (see Figure 6). "Temple of the Sun" s was the name given to it in the early Nineteenth Century, as we find in the accounts of Jerash by western travelers [3]. As told in [3], the "monumental temple of Artemis" was "often erroneously called the Temple of the Sun on account of a mistake made by Irby and Mangles, early explorers of the place" [3].

Captains Irby and Mangles visited Gerasa in 1823. In the "Travels in Egypt and Nubia, Syria, and the Holy Land", by Charles Leonard Irby and James Mangles, published in 1845 by John Murray, we find the following. In Gerasa, "There are two theatres, two grand temples; one, as appears by a Greek inscription, dedicated to the sun, like that at Palmyra, and not unlike that edifice, being constructed in the centre of an immense double peristyle court. The columns of the temple are five feet in diameter, and of a proportionate height; the capitals are Corinthian, and well executed. One singularity in this edifice is a chamber underground, below the principal hall of the temple. ... The temples, and both the theatres, are built of marble, but not of a very fine sort. Three hundred yards from the south-west gate is the circus, or stadium, and near it, the triumphal arch. ... There are numerous inscriptions in all directions, chiefly of the time of Antoninus Pius; most of them are much mutilated. The Greek inscription, before alluded to, was on the propylaeum of the Temple of the Sun, which must have been a grand piece of architecture". We find the Artemis temple of Gerasa mentioned as the temple of the sun also in a letter by Alexander W. C. Lindsay, a Scottish peer, art historian and collector, who travelled to the Middle East in 1837/38 (in the Appendix, a part of this letter is reported).



Figure 6: On the left, the temple of the Sun (Temple of the Sun front view, Temple du Soleil, pris de face, photographed by Maison Bonfils, Beirut, Lebanon, Courtesy Library of Congress, [pictures/item/2004670442/](http://www.loc.gov/pictures/item/2004670442/)). On the right, the temple of Artemis (Courtesy Askii for Wikipedia).

The temple has the same direction of the colonnaded decumanus in the Figure 5. For the analysis of the alignment of this Sun/Artemis temple, let us use a software allowing a more detailed view (software provided by SunCalc.net). In the Figure 7, we see the sunrise and sunset direction on the winter solstice.

As given by the Figure 7, it is not surprising that this temple could have been known as a temple of the sun. Probably, it had also some hierophanies linked to the winter solstice, as the Karnak temple at Luxor in Egypt had [4]. Because of hierophanies or due to the alignment, it is possible that, also in ancient times, people knew it as the temple of the sun.



Figure 7: Sunrise and sunset directions on the winter solstice as given by SunCalc.net.

## Appendix

We find the Artemis temple defined as the Temple of the Sun in the “Waldie's Select Circulating Library. Containing the best popular literature” - Part I - 1839, edited in Philadelphia by Adam Waldie. This book is publishing the letters by Alexander W. C. Lindsay, a Scottish peer, art historian and collector, who travelled to the Middle East in 1837/38. From the Lord Lindsay's Travels, pages 134-180, Letter X, written in Damascus, July, 1837. “Jerash lay before us. After a steep and rocky descent, we reached the bank of a beautiful little stream, thickly shaded by tall oleanders, and, passing through hundreds of sheep and goats watering at it, we ascended to the summit of a hill in the midst of the ruins, near a spacious oval colonnade, which forms the termination of the principal street, and was once, probably, the forum of Jerash. We pitched on the top of the hill, and, redescending, forthwith commenced an examination of the ruins. We visited the southwest section first, and, passing through the oval colonnade, ascended to the remains of a fine temple, once surrounded by a peristyle of Corinthian columns, of which one broken one only remain erect: capitals, of good execution, and fragments of the frieze are lying about. I may as well remark here, once for all, that almost all the finest works of architecture in Syria are of this order. Close to the temple stands a theatre in excellent preservation, the seats

often quite perfect for many rows together; there are thirty rows. ... A large circus without the southwest gate, and, beyond it, the remains of a large heavy triumphal arch, are the only other objects worth notice in this direction. Returning through the remains of the S.W. gate, to the oval colonnade, (of the Ionic order and in very good preservation) we proceeded along the principal street, running N.E. and S.W. along the side of the hill on which Jerash is built, and lined with Corinthian columns; at its point of intersection with another street running down to the river, (on the right, east of the town,) stand four square pedestals, ornamented with niches for busts on each side, ... The cross street lends to a bridge, and on the other side of the river (where a suburb appears (o have been built) stands a very large Christian church, and the ruins of a temple. Proceeding along the principal street, we came to a semicircular recess, on the left, of very rich architecture, but much injured; probably an ancient temple, as four fine columns, much loftier than their neighbours, stand in front of it. An inscription bears the name of M. Aurelius Antoninus.

Farther on, still to the left of the street, stands the propylon or gateway to the temple of Baal, or the Sun, the principal edifice of Jerash. It is a very handsome building; the pediments and friezes are particularly rich. A long inscription is lying on the ground in fragments; I could make enough of it out to conclude that the temple was built by one of the Antonines. A flight of steps led originally from the propylon to the brow of the hill, and a central colonnade from that to the temple. It stood in the centre of a large court surrounded by columns, of which two only, on the north side, remain perfect. The columns of the portico are in very good preservation, but not of the best execution; one of them, the second from the south, rocks in the breeze, we saw it distinctly. The inside of the temple is quite plain. Baal's worship was universal over this country ... Opposite to the propylon, another cross street runs down towards the river, bordered by columns, erect only on the south side; traces are discernible of the ancient pavement, which was raised in the middle of the street, with a trottoir on a lower level. It ends in a semi-circular platform, built up over the river. Beyond the propylon, following the course of the main street, and to the left of it, stands another theatre for wild beasts combats, with a colonnade in front of it, from which a third cross street runs down to the river, meeting the high street at a rotunda (which has suffered much from the recent earthquake,) and ending in an immense accumulation of vaults and arches overhanging the stream -probably baths. The High street runs on in a northeasterly direction, till it ends at the gate of the town. The ancient pavement is in singular preservation beyond the baths. Here ended our explorations, and now for the result, lam glad I have seen Jerash ... “

## References

[1] Wikipedia, <https://en.wikipedia.org/wiki/Jerash>

[2] Haverfield, F. (1913), *Ancient Town-Planning*, Oxford, Clarendon.

[3] M.C. Bowsher, J. M. C. (1997). *An Early Nineteenth Century Account of Jerash and the Decapolis: the Records of William John Bankes*, *Levant* XXIX, 227-246.

[4] Sparavigna, A. C. (2016). *The Karnak Temple and the Motion of the Earth's Axis* (June 13, 2016). Available at SSRN: <http://ssrn.com/abstract=2795239>