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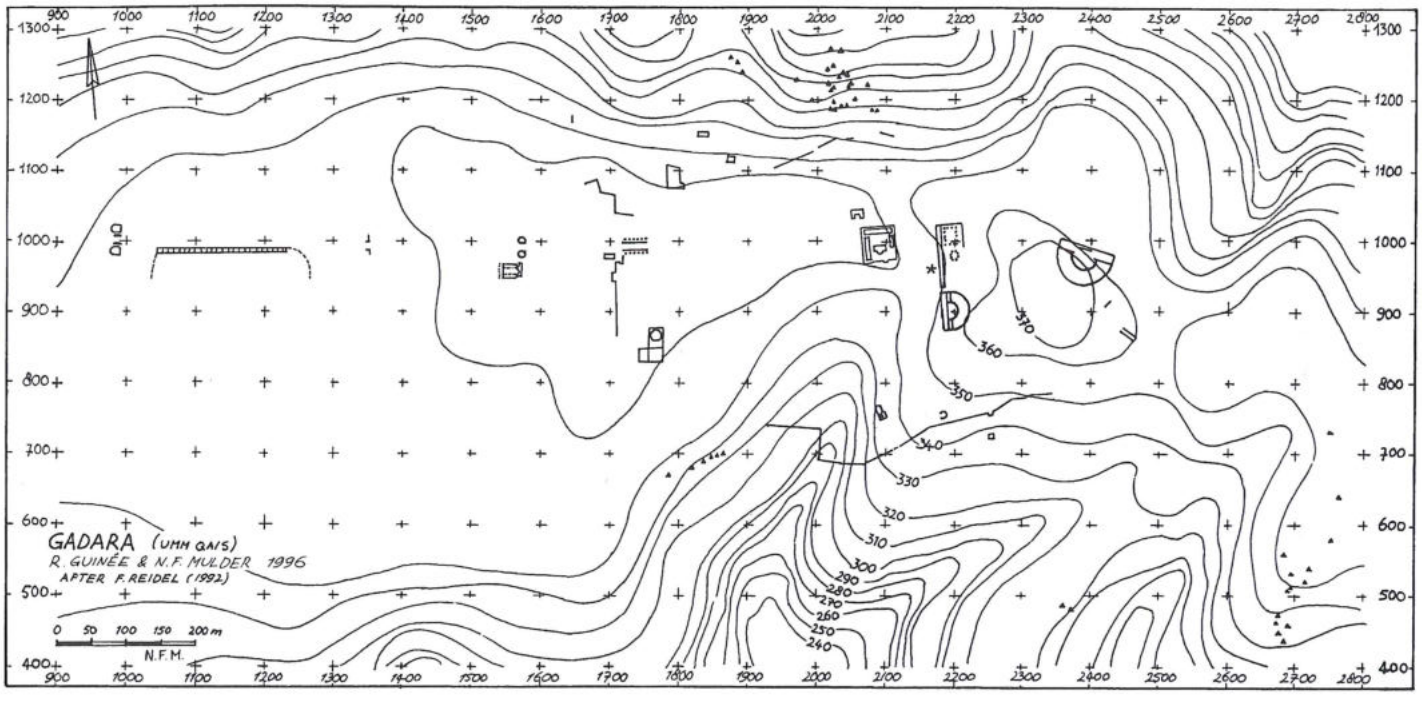
Gadara. The Terrace, Theatre and *Cardo* Quarter in the Roman period. Architectural Design Integrated in the Landscape: the Design of the West Theatre

During the excavations of areas I and III, which were carried out in 1992 and 1993 by the team headed by Ute Wagner-Lux, an archeological-architectural survey of the Terrace, Theatre and *Cardo* Quarter was made. The aim of this project is to set up a comprehensive documentation of the area and to present a reconstruction and interpretation of the buildings in their urban setting based on a comparative study of remains in other Decapolis cities.

In this paper, we discuss how one of these buildings, the West Theatre, was built using the advantages of the already existing landscape. First, we describe how the landscape offered possibilities for the contruction of the West Theatre and its surrounding buildings. Then we will focus on the West Theatre and try to reconstruct its theoretical design scheme.[1]

The landscape offered sufficient scope to arrange several functional aspects of the ancient city (FIG. 1). A few of the requirements for this city are present in the form of the natural landscape of the site as it may be reconstructed. There is a clear distinction between the higher hill to the east, where the Ottoman village is now situated, and the lower area to the west. In Roman times, this setting was exploited in order to construct an acropolis on the east side and a lower city on the west side. As a consequence, a differentiation in the function of the city districts as well as in the architectural presentation was carried through. On the acropolis, it may be supposed that the monumental edifices of the religious centre of the town were situated, together with other large public buildings, such as the two theatres of Gadara. The lower city,



1. Topography map of Gadara (Umm Qays) (after F. Reidel in Kerner 1992: 407-423, FIG. 1) * = Terrace, Theatre and Cardo Quarter.

1 We would like to thank Prof Dr H.A.A.P. Geertman of the department of Archaeology of the State University of Leiden, who over the last years has inspired and encouraged us both to study and to work on ancient achitectural design. We also thank Dr K.J.H. Vriezen for critically reviewing this paper. Except for FIG.1, all photographs and drawings by Robert L.J.J.Guinée and Niede F. Mulder.

on the other hand, may have been used to house public buildings of minor importance, along with the residential quarters. Between these two features of the landscape, the Terrace and West Theatre area can be considered as the connecting element, located between high and low, to facilitate transition from the former to the latter and vice versa.

With the help of an example we will illustrate how Roman architectural design has been integrated into the landscape. The construction of the Terrace, Theatre, *Cardo* and adjacent parts of the Decumanus can be provisionally dated to the end of the first century or the second century CE. These buildings must be considered as a complete unit. This claim is held to be correct by the comparison of the axis of the theatre with that of the façade of the vaulted rooms along the *Cardo*, which shows that these axes are perpendicular within less than half a degree. This has been calculated precisely, with the help of a computer. Even the *Decumanus Maximus* seems to fit into this orthogonal system, having an axis that crosses the axis of the *Cardo* at an angle very close to 90 degrees. However, we were not able to measure as many reference points as could be desired on the Decumanus.

Therefore, the Terrace and West Theatre Quarter may be treated as part of one single urban concept. Not necessarily constructed at the same time, but undoubtedly conceived and planned as one coherent layout, it shows an axial plan for the city. Although this particular area only represents a small part of the ancient city, it may be assumed that its axial layout was projected to the west along the *Decumanus Maximus* in such way that, whereas the *Decumanus* stretched along the ridge of the plateau, the several *cardines* followed the contours of the hills. The ridge may be treated as the backbone of the ancient city, to which, in accordance with the possibilities offered by the landscape, the various quarters were subsequently added. It seems reasonable to conclude, that, therefore, despite the form of the landscape, a pure mathematical scheme was used for the city plan. In elevation, however, the differences in height within the landscape have been utilized.

In order to illustrate how the architectural design has been integrated into the landscape one element of the area needs to be examined in detail, because it offers an unparalleled opportunity to understand the methods of the Roman architects when they adapted the landscape to their ideas.

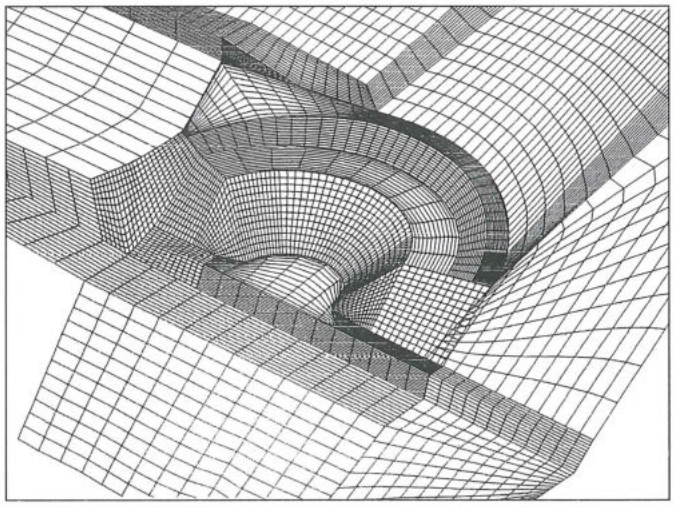
This element is the West Theatre (FIG. 2). In this building, a typical Roman theatre was conflated with the traditions of the Hellenistic culture. Greek theatres were traditionally created on the slope of a hill in order to save labour which would be required when building higher and higher elevations. The West Theatre in Gadara, however, although it is built against the slope of the hill, is definitively a Roman rather than a Greek theatre as it shows characteristics of the Roman theatre tradition: the semicircular *orchestra*, the existence of *vomitoria* (entrances) connected to an *ambulacrum* (vaulted corridor) running underneath the tiers of seats, and the vaulted *aditus maximi* (side-entrances).

For the West Theatre, buttresses have been constructed to create space on which the architecture could subsequently be erected. In section, corresponding with the east-west axis, the theatre reveals four different levels of building (FIG. 3).

On the first level (the lowest part of the slope) the foundations of the *scaenae frons* (the back wall) were erected. Unfortunately, the level of the bedrock has not yet been established here, because, at the time of this survey, that part of the theatre had not yet been excavated. However, as a provisional height, a level of 340.46 m asl was taken, representing the lowest point of the backwall visible above the earth and the debris.[2]

The second level is the floor of the *orchestra*, together

2. The West Theatre in 1995 after clearance by the Department of Antiquities.



3. Reconstruction by computer of the surface contours with the different building levels of the West Theatre.

2 These heights are related to a network of points, established by E. and A. Gramlich (Fachhochschule Karlsruhe) within the already existing geodetical grid on the site.

with the floor of the entrances leading to it. Here, bedrock was indeed found at a level of 341.20 m.

The third level represents the floor of the *ambulacrum*. It is on the same level as the first *praecinctio* (a semi-circular passageway dividing the seating complex of the *cavea* into horizontal sections). Here, too, bedrock was found at 348.10 m. The flagstones of the floor are laid directly on the rock.

The fourth is the level from which the staircases in the entrances at the exterior begin to descend into the theatre. Unfortunately, they have not yet been completely uncovered, thus making it impossible to establish the exact height of this particular level. However, in one entrance (FIG. 4) as many as seven steps were exposed, which data enabled us to calculate provisionally the height of the fourth level at 351.70 m.[3] This level not only carried the outside wall of the theatre, but presumably also a street, which gives access to the staircases which descend into the entrances. In summary, the following elevations may be established:

Table 1. Heights of different building levels.

Level	Description	Height in metres asl
1	Back wall of the scaenae frons (lowest point visible in 1992)	340.46
2	Orchestra floor	341.20
3	Ambulacrum/ First praecinctio	348.10
4	Bottom of external wall;entrance- level	351.70

It is possible that every building level may be connected with a stage in a design that, in plan as well as in elevation was developed according to principles, like the ones in Vitruvius' *De Architectura*. In fact, though the rules for building a Roman theatre (as explained by him) have never been followed for any theatre, the hidden principles in these rules allow one to make a hypothesis on theatre design. They seem to offer general principles to the Roman architects on how to handle complex designs, which are based on simple geometrical and arithmetical calculations. Not all of the relevant elevations have been established for the West Theatre in Gadara, therefore only the design scheme of the theatre plan can be discussed here. We hope that, after further research, it will be possible to relate the elevation of the building to this scheme.

From the existing situation of the West Theatre as measured in the field, it has been possible to reconstruct a theoretical design scheme for the plan. During the efforts to find this scheme, every hypothetical design scheme has been verified by comparing it with the measurements that

4. Steps in one of the eastern entrances. View from the *ambulacrum*.

were collected during the survey. However, before this study could be commenced, two elementary points had to be established.

First and most important, in order to verify the design scheme it was necessary to establish the exact central point of the building. As will be shown in the following, this central point is the centre of a circle that forms the basis for the design of the theatre. After all, the classical theatre building is generally based on a circular pattern.

There are several ways to establish this centre; but the only reliable method was found to be the following. The line, dividing the orchestra into two equal parts, being the median between the *aditus maximi* to the orchestra, is the very line on which the central point should be sought. Because a large number of fix-points could be measured in the first *maenianum* (rank), indicating every single tier of seats (which in fact are semicircles), it was possible to establish corresponding central points for every one of those tiers. Each of the central points appears to be situated on or very close to this median. It appeared that these central points indicated that the centre of the theatre was placed on the intersection of the median with the line connecting the eastern side of the stairs ending the *cunei* (part

[3] This level was calculated by projecting the height of the internal arch of one of the eastern entrances (FIG. 4) towards the external wall. At this point the highest level of the bedrock is expected.

of the *maenianum*) on the north and south side (FIG. 5) of the *cavea* (public seating area). Because the tiers in the lower *maenianum* do not seem to have moved much during several earthquakes which destroyed other important parts of the building, this method seemed to be the most reliable one.

The second basic fact which needed to be established was the standard length used in its construction. Having stated previously that the theatre is Roman, it seems reasonable to try to establish the length of the Roman foot that was used. During the survey, it appeared that almost everywhere stone layers of 59 or 29.5 cm were applied. This suggests that the foot, in this case, was 29.5 cm.

Having established these two basic facts, we will try to reconstruct the Roman design scheme of the theatre. This will be done in four stages. Each step of the design scheme determines the position of several elements of the building. These elements were erected on terraces built at elevations corresponding with the building levels described above. Furthermore, every stage in the design scheme is based on the preceding one.

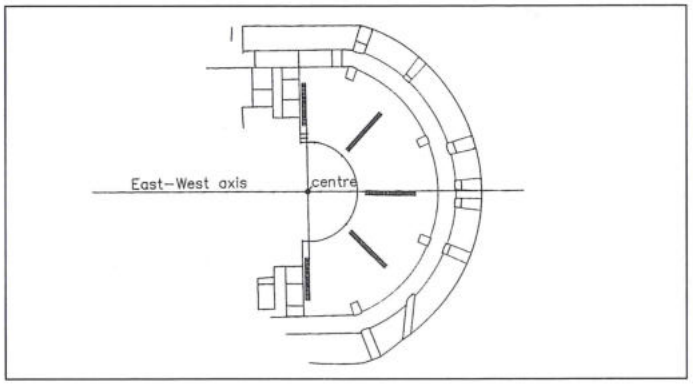
First, from the established central point of the theatre a circle of 90 Roman feet in radius can be drawn. This circle determines the position of the outerside of the external wall, and corresponds with our measured points, except for those at the south side where the bond of the wall has been disturbed (Step I: FIG. 6).

Second, an equilateral triangle is drawn in this circle with its base on the west side and its perpendicular to the east-west axis of the theatre. This base of the triangle probably defines the outside of the wall of the *scaenae frons* as well as its foundations. Unfortunately, at the time of the survey, only the top of the remains was visible and only two points could be measured, on which basis no definite conclusions could be drawn. This means that, for this part of the theatre, the reconstruction of the design scheme is still hypothetical (Step II: FIG. 7).

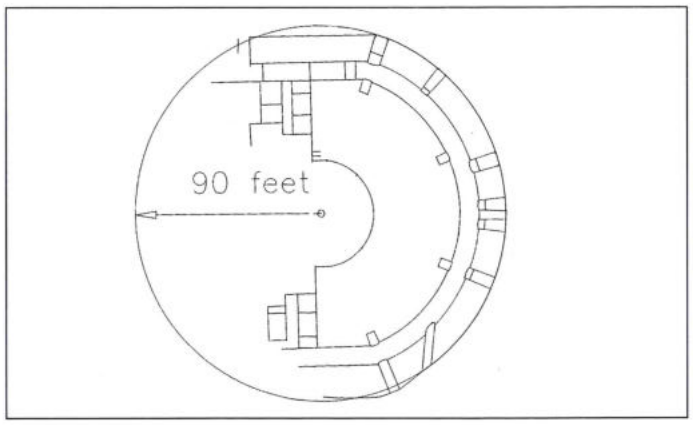
Now that the position of the external walls of the theatre on the highest and lowest terraces have been defined, the position of the internal elements on the two intermediary terraces can be established.

Third, from the central point of the theatre, a new circle, (with a radius of 26 feet) can be drawn. This circle defines the semicircular eastern boundary of the *orchestra* on the same elevation as the second terrace. In total, six points could be measured and used for verification. Although, at the north side, there is some deviation, these points correspond with such precision that there is a reasonable certainty that this particular method is valid (Step III: FIG. 8).

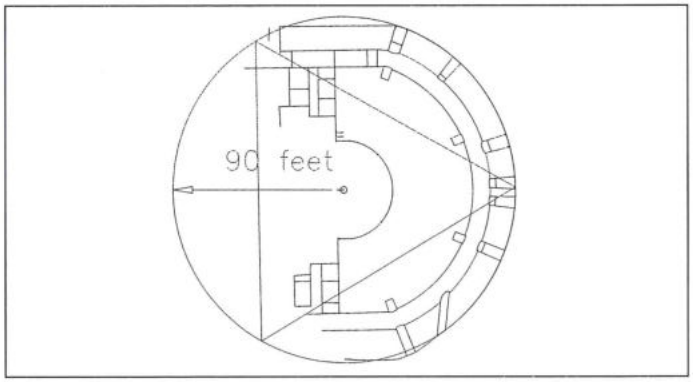
Fourth, two equilateral triangles can be drawn with their bases on the north and south side within the first circle of 90 feet. The intersection of these two triangles on



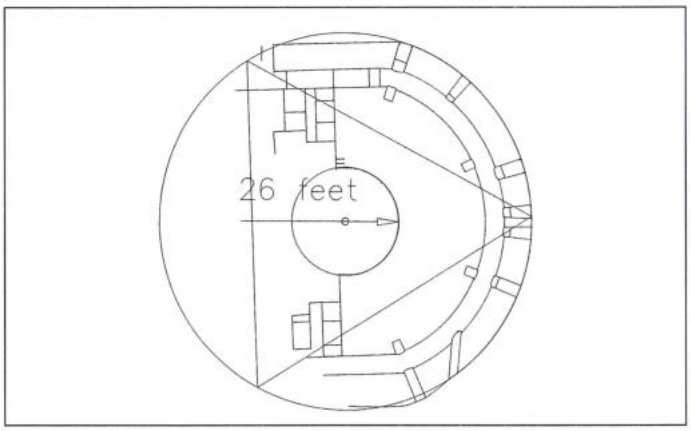
5. Derivation of the exact central point of the West Theatre.



6. Step I: a circle of 90 feet that determines the external wall of the theatre.



7. Step II: an equilateral triangle drawn in the circle of 90 feet with its base on the west side defining the platform that carries the foundations of the *scaenae frons*.



8. Step III: a circle of 26 feet defining the wall of the *podium* limiting the *orchestra*.

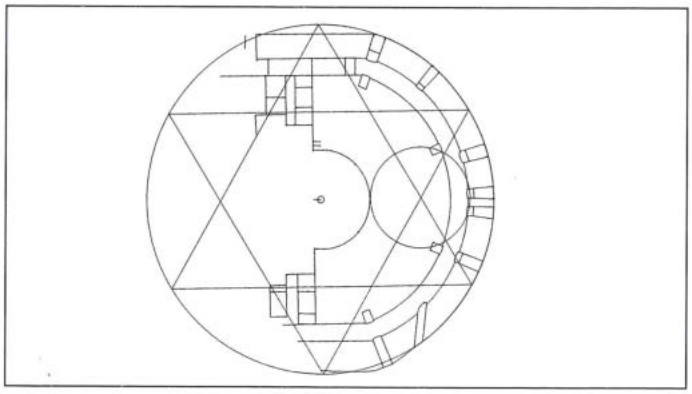
the east side defines the central point of a circle of 26 feet. The east side of this circle touches the outer wall of the *ambulacrum* and thus the outer boundary of the third terrace, being on the level of the floor of the *ambulacrum* as well as of the first *preacinctio*. The radius of the circle that defines the outer wall of the *ambulacrum* is 78 feet (Step IV: FIG. 9).

In TABLE 2 it can be shown that the points which have been measured correspond to the requirements of the theoretical design scheme:

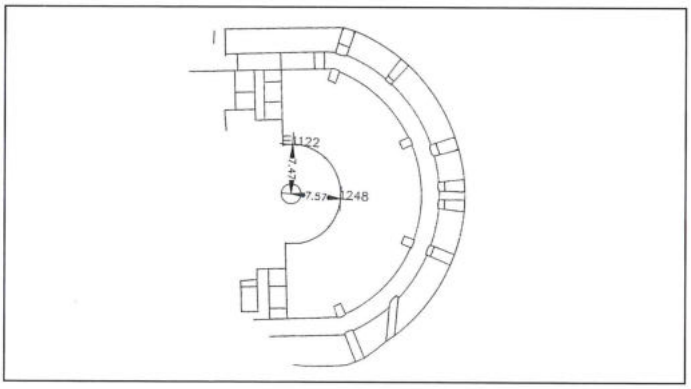
Table 2. Distances to the central point of the theatre (see also FIGS. 10 and 11).

Object	Number of measurepoint	Distance to central point (m)	Theoretically required distance (metre)	Deviation (metre)	Distance (foot)	Theoretically required distance (foot)	Deviation (foot)
Orchestra 1	1248	7.57	7.67	-0.10	25.66	26	-0.34
Orchestra 2 *	1246	7.53	7.67	-0.14	25.53	26	-0.47
Orchestra 3 *	1247	7.57	7.67	-0.10	25.66	26	-0.34
Orchestra 4 *	1249	7.50	7.67	-0.17	25.42	26	-0.58
Orchestra 5 *	1250	7.52	7.67	-0.15	25.49	26	-0.51
Steps **	1122	7.47	**	**	**	**	**
External wall 1	3031	26.59	26.55	+0.04	90.14	90	+0.14
External wall 2	3036	26.65	26.55	+0.10	90.34	90	+0.34
External wall 3	3048	26.69	26.55	+0.14	90.47	90	+0.47
External wall 4	3064	26.61	26.55	+0.06	90.20	90	+0.20
External wall 5	3203	26.75	26.55	+0.20	90.68	90	+0.68

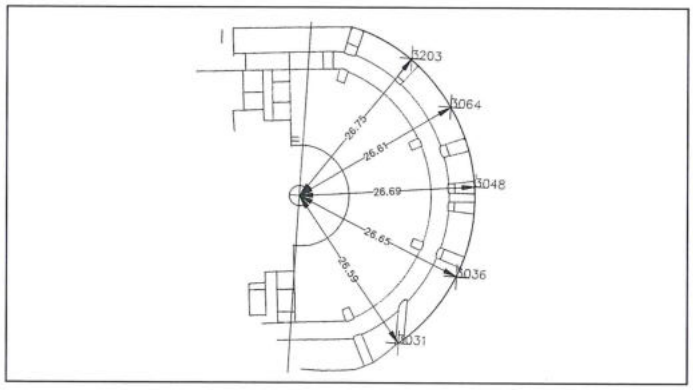
* These points are not shown in the illustration
** This point is not directly defined by the circle of 26 feet, as it belongs to the steps



9. Step IV: two equilateral triangles with their bases to the north and to the south side drawn in the circle of 90 feet. The intersection of these two triangles on the east side defines the central point of a circle of 26 feet. The circle of 26 feet defines the outer wall of the *ambulacrum*.



10. Distances of the *orchestra* to the central point.



11. Distances of the external wall to the central point.

Some discrepancies exist between the theoretical design and the current situation presented in our measurements. This can be explained, however, by some causes that had their effect on the building as it still is. First of all, throughout its existence of almost 2000 years, this building has suffered various disasters such as earthquakes. The walls of the theatre have been constructed by building two wall faces of basalt blocks, the interior space having been filled with soil and stone chips *(opus caementicium)*. During an earthquake, the filling will move downwards and push like a wedge between the two wall faces. In this process, the outer walls will be pushed outwards and, at the same time, the inner walls will be pushed inwards. Second, the site was quarried for stone, especially when the Ottoman village was built. Thus many of the stone blocks have moved their relative position to each other. Since only the present (and not the original) position of these blocks can now be measured, many deviations can possibly be explained. It is also possible that during the construction of the theatre the work was not executed with strict adherence to the design. This may also explain deviations of several centimetres.

It seems plausible that, before the contruction of the theatre, the plans of the design stages were incised in the bedrock or, where this was not directly on the surface, marked in the earth by using wooden stakes (for example). Then the bedrock or earth was removed to create the terraces on which, according to the instructions of the architect, the building was erected.

It can be concluded that the architect who designed the West Theatre wanted to exploit the possibilities offered by a landscape which could be enhanced by a building. He conceived his plans having been firmly based on these natural foundations. As it seems, geometrical patterns formed the basis for the design scheme of the theatre, which will probably be more complicated by using arithmetic calculations when we will look at the details. In this way, the West Theatre of Gadara reveals that the architect must have been quite familiar with design techniques which are very similar to those we already recognize as Roman building principles.

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