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THE ALEXANDER MOSAIC AND THE HOUSE OF THE FAUN (POMPEII VI 12, 1-8) GEOMETRY PROPORTIONS AND ART OF COMPOSITION

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Abstract. This text analyzes the celebrated Alexander Mosaic, found in the House of the Faun in Pompeii starting from the premise that it may hide the traces of a compositional process based on rules that built its origin, the Ground Zero of any work of art as such. A painstaking process of calculation and precision based on regulators, even surprising symmetries, and aesthetic precision in the placement of figures that projects the represented scene in a well-defined, memorable, self-sufficient and "representational" form. Finally the text analyses the relationship between mosaic and the composition process of the House.

Keywords: geometry and art, composition, Alexander Mosaic Pompeii

Mathematic Subject Classification: Primary 01A20

1 The *Gran Mosaico*

On October 24, 1831, a surprising discovery was made in the so-called *Domus* of the Faun. The mosaic found at the center of a room with two red columns entered through a Nilotic-themed threshold was clearly "of a quite eminent value ... And its style and execution are finer than any other similar work from the ancient times, including the five other works discovered in the same house and described in the press. 9 pl. wide and 19 ½ long, this large mosaic made of tiny *tesserae* of colorful marbles depicts a battle between Greeks and Barbarians". [9]

While other mosaics had actually been found in the house – apparently belonging to the same figurative scheme [29] and made of tiny *tesserae* – the Alexander Mosaic was immediately recognized for its exceptional value [18] [19] [24]: "... in the combination of so many fine and valuable elements within a very large composition where every group, figure, and line resulted from the most accurate research and endless precautions, the highest value seems to be that no trace of a study, nor the clue of a pre-ordained intention seem to emerge".

(fig. 1)

The art historian, the militant critic or simply the scholar who looks at the battle offers a different interpretation; and perhaps, the painter had a meaning in mind that none of them can see, or he just conceived it as a riddle. The game of coincidences seems to increase the myth.

As of today, there are still many hypotheses on the table, all of them deserving the benefit of the doubt. There is still no consensus about which battle the scene represents. Neither is there consensus about who might have designed the mosaic. Some argue it is the copy of a painting, and therefore are more interested in discovering the name of its author [7] [29].
These questions consequently lead to a third question, itself unanswered yet, about the mosaic's actual place of origin.
The Hellenistic origin of the mosaic seems quite clear due to the absence of recognizably Roman elements in it. There may be a relation with a painting made during Alexander's life [7] [29].
That the figure depicted is indeed Alexander seems equally out of question, as proved by the other mosaics found in the House of the Faun (itself Hellenistic in terms of type) [17] [28] that narrate a precise history, from the hall through the room with two columns where the Mosaic itself was placed [21] [23] [29].
The mosaics in the House of the Faun (except for the one left in situ) seem to result from the artisanal skill of mosaicists based in Alexandria in Egypt [3] [12] [23] [29]. This is not surprising given the close cultural relationship, now clearly established, between Greek Hellenism, Egyptian Hellenism and Pompeii. [13]
Therefore, if the mosaic indeed came from Alexandria, it could only belong to the royal circle due to its value and because the artists who worked at the Museum of the Palace were exclusively employed by the King and therefore belonged to his "stable" [11] [25].

Fig. 1
(Courtesy MANN Archaeological Museum of Naples)

1.1 The Art of composition and its rules. Within the symphony of the Alexander Mosaic

This could be any one of the battles fought by Alexander against Darius during his quest to submit the Persian Empire and thus reach "the ends of the world". This (now) iconic image of Alexander summarizes memorable facts and makes us glimpse, for a moment, into the void of those obliterated actions, the facts that do not exist anymore, the lost events nobody will ever see again. Yet, in the absence of certain proof, what could be the right key to approach this work with a less superficial admiration (other than a generic appreciation of its "beauty"), or a

critical point of view that, unburdened by the complexity of a historical/critical assessment, frames it in a more contemporary dimension that is closer to our understanding?
Which methodological meditations could arise from this artwork?
Perhaps the definition of "copy" of a lost painting, often used for this mosaic, is not appropriate because it inherently (although involuntarily) lessens its value. There was probably a cartoon or a sketch, or the theme was inspired by a then celebrated painting. Nevertheless, the reproduction of a work from a technique to another is neither elementary nor automatic.
Therefore, the mosaic should be viewed as a unique artwork in its own right, particularly because it was executed with the technique of a painting and, given the highly skillful use of tiny tesserae; it was indeed defined as a painting. Since for Pliny (Naturalis Historia books XXXIII-XXXVII) *opus vermiculatum* mosaics were indeed paintings, the resulting ambiguity may have led to the interpretation of a painting as a mosaic and the other way around.
An artwork results from a process during which the composition develops towards its completion in a calculated and precise way necessarily based on hidden regulators, possibly surprising symmetries and an aesthetical precision in the placement of figures. Thus, the vision of the battle is crystallized (fixed) in a frame in a well-defined, memorable, self-sufficient, "representational" form.
The artwork might have followed the rules of *skiagraphia*, a technique mentioned by Pliny and Quintilian due to which painting rises above mere drawing (Moreno 2000). All this would be complemented by Aristotle's studies on the perception of colors.
In the Alexander Mosaic, the cold hues (blue and green) are missing. As we know from Pliny, classic painting only relied on *tetrachromy*, or the four earth tones – white, black, red, and yellow including all their varying hues – obtained from the natural soil.
The subtleties and high refinement encapsulated in the battle moment should hide a less apparent plane made of measures and a clearly defined grid. Art is supposed to produce *the precision and rigid consequence of a mathematical problem*: axes, circles, right angles are the principles of geometry and the effects our eye measures and recognizes – without these elements, there would be nothing but randomness, anomaly, discretion. The Ancients relied on this necessary tool. But very few artists revealed how they composed their works, and rather scattered around the clues of some mysterious game.
The outer frame, probably applied at a later stage with larger *tesserae*, except for the flowers that match those found in Abuqir/Canopus and here in the frame ideally fix the work to its backing [5] should be considered as external to the painting's space.
The horizontal band executed in one color (perhaps originally bearing a phrase like the one of the Thmuis mosaic found in the Nile Delta) should be recognized, instead, as part of the painting's space. Often forgotten and erased from reproductions, this band actually plays a key role in the painting's geometrical proportions. For this reason, it should be considered as a silent place, an empty but necessary space.
When viewing the work, our look immediately goes to the fragment that depicts Alexander and his horse because the figure has become a universal icon and the fragment is the survivor of a lost mosaic surface. The horse is not Bucephalus.
Alexander only rode his beloved but quite old black horse at the end of the battle.
The profile follows clear geometrical rules: eyes, chin, and ear create an equilateral triangle one side of which is adjacent to the vertical line I will illustrate thereafter.
If you consider a square built on the painting's shorter side (not including the silent band), Alexander's face is placed above the two diagonals, precisely on the vertical line on which the Macedonian king's profile is built.

The horizontal line that corresponds to Alexander's gaze is slightly above that of all the human figures in the background, all aligned on the same horizontal line.
This square encloses the true fate of the battle. With his spear, Alexander pierces one of the enemy generals whose face corresponds to the quarter of circle built on the corner of the square.

If, starting from the opposite short side, one builds a square that has the same size as the previous one and mirrors it, the diagonal of this square defines the position of the face and the inclination of the body of the standing enemy general (Darius) and the chariot's horses.
The arm of the charioteer who turns around is parallel to the quarter of circle pointed on the second square's bottom corner.
The line that unites the gazes of Alexander and Darius forms the hypotenuse of a right-angled triangle the shorter side of which falls on the quarter of circle on the right-hand square.
The spears in the foreground are parallel to the diagonal.
The vertical band formed between the two specular and symmetrical squares has the same size as the monochrome one at the bottom of the painting. This band is equally silent, a sort of free area where nothing happens.
The axis of symmetry is hidden in the silent band. **(Fig. 2)**
The axis is perhaps the earliest manifestation of man. The axis provides order.
Once this silent and empty zone is recognized, that is where the gaze lingers:
this is the painting's point of balance.
The human figure found in this point is the only one looking right at the viewer.
While seeming to turn his back, the figure suddenly turns around and directly engages the viewer. If you look at him carefully, you will notice that he is tangent to rather than precisely on the axis of symmetry. With a shrewd theatrical device, he seems to glance at Alexander. Actually, he shows us the exact position of the axis of symmetry.
This character reveals the uttermost secret – the center of the composition.
The order underlying the entire work.
Who is he? The artist? Look at his hat. Rather than a helmet like the ones the other Greeks wear (it has no metallic glint), it looks like a fabric or leather cap.
He is an intruder in the scene who looks at us to reveal a secret. Oddly, nobody ever noticed him before.

Look at the only two figures who stand above Alexander's gaze, the most important being the Persian (Darius) who stands on the chariot, apparently in retreat – this is nothing but a device to establish a symmetry with the dead tree (an element that was interpreted in a number of ways: [26]. The tree's branches perfectly mirror the standing general's arm and that of his charioteer. Being the losing party now retreating, they are likewise a dead tree, the symbol of a dying empire.
If you carefully observe the plane geometrical figures thus obtained, you will find countless other correspondences with the figures in the painting. The fallen figure who looks at his reflection in his shield lies within a right-angled triangle obtained from the diagonal. Famously, this figure was put in the wrong place when the mosaic was reconstructed in the House of the Faun.
Keep on studying the geometric space of the mosaic.
The horizontal line that runs through the gaze of the central figure (the hypothetical author) cuts the length of mosaic's bottom side (including the horizontal monochrome band) according to the Euclidian principle of division of a segment into *extreme and mean ratio*.

Otherwise said, the golden section**. (Fig. 3-4)**
Therefore, the above mentioned short side of the mosaic is bisected by the horizontal line generated by the gaze of the central figure according to the concept of the *proportional medium* (Euclid, *Elementi*, libro VI), and the ratio between the unequal lengths obtained with the total measure is exactly the irrational number 1.6180 – the golden ratio, or Phidias constant.
The mosaic's longer side is three times the longer segment of the proportional medium obtained on the short side. In other words, the entire surface comprises three golden rectangles (as we would call them now), the longer side of which coincides with the mosaic's short side.
The Alexander Mosaic reveals a remarkable skill in the use of geometry and space as mandated by the geometrical theories of Euclid, the "Composer of Elements" (a contemporary of Alexander's) who was called by Ptolemy I Soter to work in Alexandria at the time when the great Library and the Museum were established [11].
The axis of vertical symmetry and the horizontal secant line obtained through the rule of *proportional medium* (the point of intersection of which is indicated by the unknown character) are the matrix of the painting's geometries. The distance between the parallel lines that define the main symmetrical squares provides the module that divides the space occupied by the battle scene. The rotation of Alexander's spear also finds an explanation within this modular grid. **(Fig. 5)**
But that is not all.
The enemy army only seems to be advancing. This deceiving impression results from the point of view. Look at the figures in the background aligned along the central horizontal line, the Greek helmets in the third row are beyond the symmetry axis and superposed to the Persian helmets. The structure of the painting is designed both frontally and in plan, with the placement of the armies and Alexander who breaks the ranks and charges on.
The center of symmetry results from a three-dimensional imagination that transcends the plane figures. The drawing is imagined in the three spatial dimensions (we might say in 3D). And, according to the composition's measures, the figure that reveals the enigma plays a central role in the other spatial dimensions as well.
It is clear, by now, that this is a unique work in its own right rather than the replica of an existing artwork. Those who discovered it recognized this immediately. Its author was so convinced he was involved in an extraordinary achievement that he unexpectedly introduced his own portrait in the mosaic.
As a painting, it would not even be placed on the floor, just like many of the artworks that are called paintings would not be necessarily paintings at all. Indeed, at that time, the word *téchne* had a meaning that comprehensively embraced art, skill or even manual skill in a way that never fully separated what deserves to be called art from what fails to earn such qualification [36].
Now, let's go back to the figure at the center of the composition: who is this man?
Having established measurements and geometries, one can only delve into the realm of probabilities and statistics. As mentioned before, he could be someone who wanted to leave a sign of his own presence in a work that he recognized as special. The fact is that, except for the descriptions of lost works, no work found so far is comparable to the mosaic.

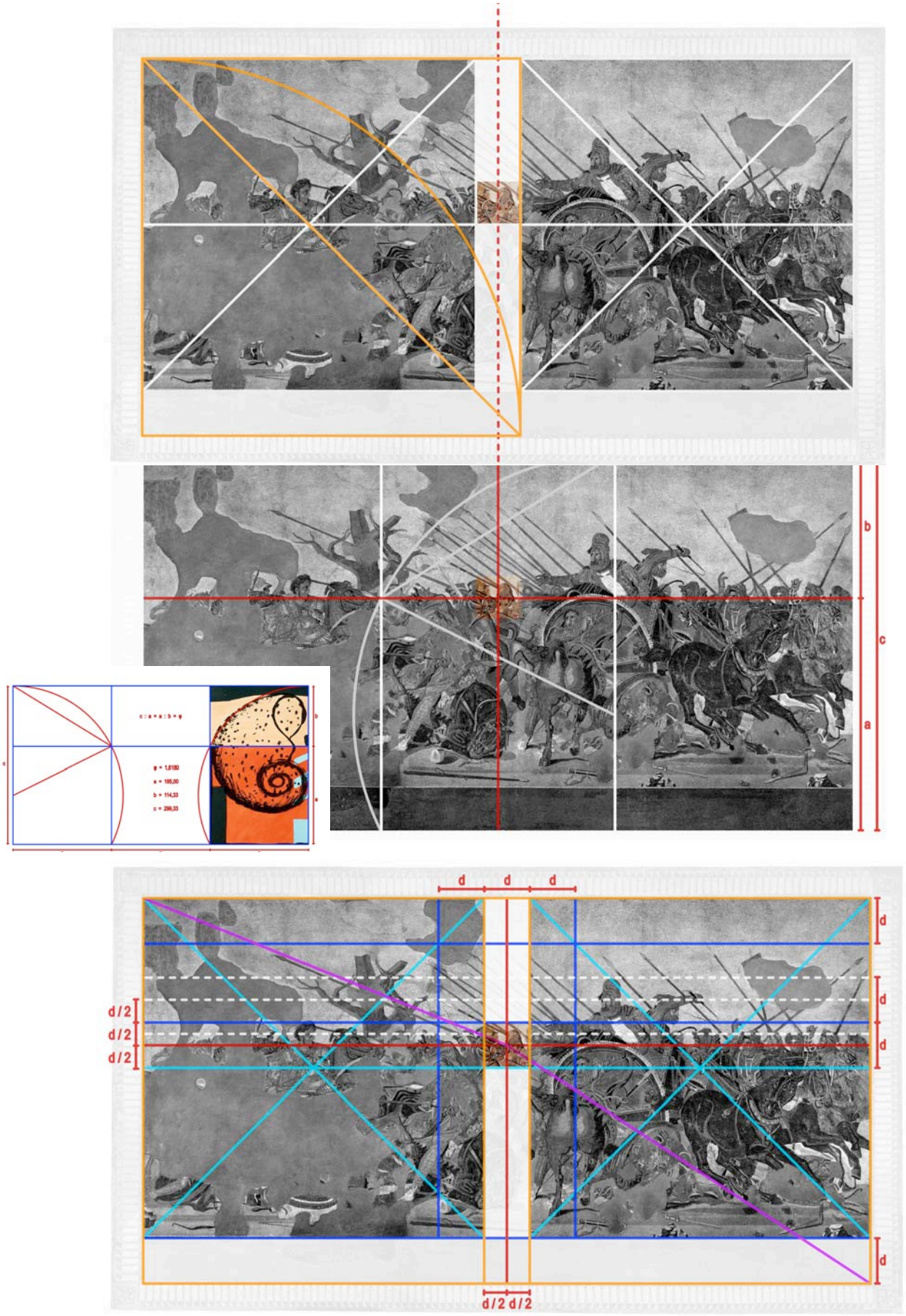

Fig. 2-3-4-5
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If the Mosaic indeed comes from Alexandria and is related to a painting from Alexander's time – 330-310 (Cohen 1997; Moreno 2000) – then some clues could emerge from the names of the artists who worked at the court of Ptolemy I Soter at the time. [1] [11] [14] [16] [25]:
aside from Euclid there was the painter Antiphilus of Naucratis. Philoxenus of Eretria, a painter of the Theban-Attic school was also in Alexandria [2]. Some scholars believe that certain elements in the mosaic would intrinsically point to Apelles as its author [19].
Finally, Helena also worked in Alexandria: Helena, the daughter of Timon the Egyptian, is perhaps a poetic invention [5]. Or not.

2 The Alexander Mosaic and the House of the Faun

The House of the Faun, as we see it today, is the result of two main constructive moments both dating back to the 2nd century BC [8] [15]. The first plan dates back to 180 BC, the second to the last quarter of a century, when the house was completely renovated, enlarged, reworked in typology, in the whole of the geometric relationships, in the studied sequences. This is the moment when the precious cargo with the Alexandrian mosaics comes into play.
The Architect who carried out (in Ancient times) the restoration has found a house with a Tuscan *atrium* (connected to a second *atrium* also Tuscan but not open to the street). The Tuscan *atrium* has golden proportions and a *tablinum* as usual (Vitruvio, *De Arhitectura*) is arranged along the longitudinal axis. The first peristyle was already part of the house. Here the new intervention is limited to the transformation of the entrance hall and the arrangement of new stuccoes and new decorations and of course the insertion of the well-known mosaics mentioned above.
The part of the building containing the *tablinium* (to which the new three-dimensional figure floor is inserted) perhaps had already the depth visible now. The new project also connects the second *atrium* to the street, turning it into a Tetrastyle *atrium*. The latter remains an *atrium* related to the servant side of the house and, through a long corridor, is connected to the new great peristyle. A perpendicoular body is added that closes the first peristyle identical in thickness to the *tablinium*. Here the *exedra distila* which houses the mosaic of Alexander facing the first peristyle and the *tablinum* and a detached room with the lion's mosaic facing the new great peristyle. The latter closes with a built wall containing *lararii* and a small temple. At the center of the peristyle have been found statues probably referring to the rites that were celebrated in the small temple. Among other things, the columns in front of the temple are spaced the same size, probably to allow the view of the center of the garden of the great peristyle.
The architect built two itineraries in the house each of them related to the respective *atrium* on which relates specific perspective point of view. The first itinerary is a real museum tour and the second that seems to be linked to the service functions of the house is also the direct connection to the second peristyle. **(Fig. 6-7)**
The museum sequence describes a story related to the Egypt of the Ptolemaic court: scenes are followed by Dionysian connotations and typical settings of the Nilotic landscape (Alexandria and Canopus); erotic scenes, Dionysian scenes. So starting from the Tuscan atrium (a theatrical scene with false double height, also found in large Ptolemaic ships to amplify the space) the visitor is guided through a story.
In the central *tablinum* there is a geometric mosaic with three-dimensional figures, composed with rare and precious stones of east origin. On the visual perspective axis the exedra distila with the red columns (royal color). The culmination of the route is the distila hall (esedra)

with the Alexander mosaic that opens towards the peristyle. And the exedra is the crucial point of the museum itinerary. The two red columns are the arrival point of the visual itinerary of the whole house. Inside the Great Mosaic. The two rooms next to the exedra open towards the second peristyle, a place of sacred representation. The body that contains the exedra appears to have been on two floors. A covered porch was arranged on the three rooms and overlooked the large peristyle.

2.1 The Iconic light of Geometric Relationships

At this point, however, it is permissible to ask what was the process of project construction, the work of composition that underlies the figure of the house with its paths.
A modular grid has been identified, very similar to that used for large Hellenistic buildings [7] [8] [15]. The house is divisible into geometrically coherent parts and divided into two by a middle line tangent to the south face of the part of building containing the distyle room.
The two *atriums*, with their respective rooms form two identical squares. The two transverse bodies (depth equal) respectively included with the two relative peristyles form a square and a rectangle [7]. It is also evident an elementary reference grid that is the sub-multiple of the previously described geometrical ensemble, very similar to the modular references of the great Hellenistic buildings.
These important considerations are necessary prerequisites, but we need to clarify other aspects of the project, for example the relationship between the transverse building blocks and the module, the geometric role of the distiye room (which after all contains the most important artwork) and the layout of the Alexander mosaic. Finally, the relationship between mosaic and distyla room, between distyla room and the House.
Starting from the previous considerations, the following relationships can be noted.
- The square geometrical figures quoted have a modular dimension with a sequence of square numbers (Pythagoras): 2x2 + 2x2 (Atriums); 3x3 (first Peristyle); 4x4 + 2x2 (second Peristilio)
- The west side of the Tuscan *atrium*, first peristyle and second peristyle are aligned and coincide with the module as previously identified.
- The dystile room is built with golden proportions.
- By projecting the size of the *tablinium* in the Tuscanic *atrium* it is possible to verify the alignment with the west wall of the distyle room. The distance of the west wall from the module is the same as the linear projection of the east wall of the tablinium with the east wall of the distyle room. The east wall of the hall is also aligned with the east side of the Tuscan *atrium*. **(Fig. 8)**
- The large mosaic (the original) is not placed centered on the room but adjacent in its longer side above the module (note well that the position of the mosaic is not that given to the modern copy now in the house, but the one designed by Fausto and Felice Niccolini at the time of discovery). This alignment forms the side of an isosceles triangle whose vertex coincides with the intersection of the diagonals of the rectangle formed by this alignment and the three sides of the peristyle. This triangle is subdivided into two triangles (almost sacred triangles with proportions identified by Pythagoras with 3, 4, 5 units). The intersection between the apex and the diagonals of the Peristyle is the central point referring to the small temple on the north side Peristyle. **(Fig. 9)**

Constructing a circle of radius corresponding to the side of the isosceles triangle are obtainedthe position of the left column of the Exedra, the position of the fountain of the first

Fig. 6-7
(© LuisaFerro)

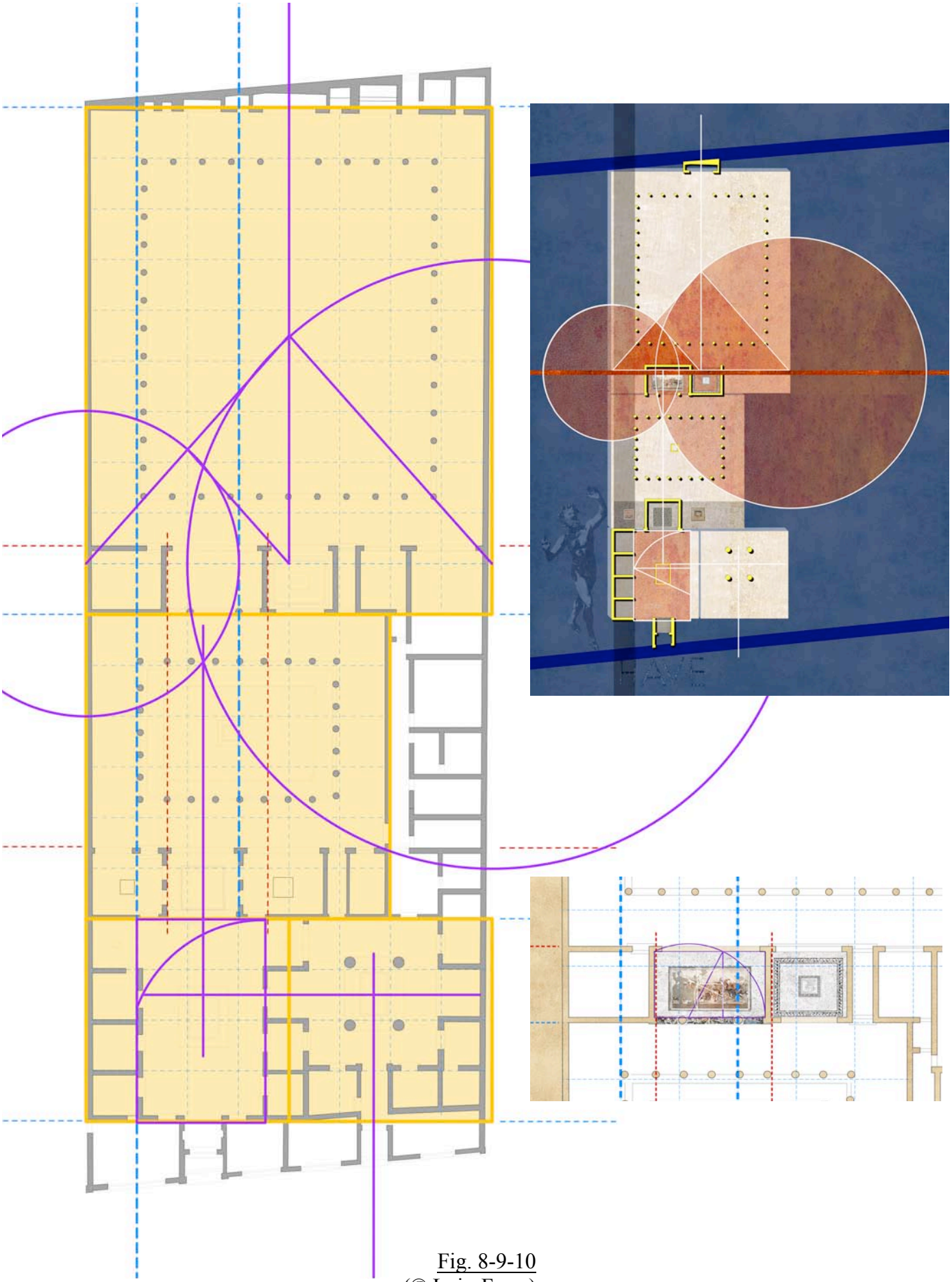

Fig. 8-9-10
(© LuisaFerro)

peristyle (which wrongly seemed arranged without geometric reasons) and the southeast corner of the first peristyle. The radius finally identifies the position of the corner column of the south side of the peristyle, which before seemed to be the only side not coincident with the modular grid.
A smaller circle is constructed with the radius given by the side of a second isosceles triangle with a base from the median of the first triangle to the extreme west of the mosaic alignment. The intersection with the major circle coincides with the axis of the tuscan *atrium*.
- The second column of the distyle hall corresponds to the modular grid.
All this demonstrate the geometric centrality of the *exedra* (distyle room) containing the Alexaender mosaic, a sort of casket that not only contains a very precious artwork, but is the geometric secret of the whole house, its ideal construction. A hinge between the existing (modified) part of the house, the new buildings, the new great Peristyle.
Going back to the construction of the golden proportion of the distyle hall, considring the mosaic in its original position, the average proportion of the room coincides with the golden rectangle of the mosaic on which Dario is depicted, while the axis of the tuscan atrium (around which all the mosaics of the cycle are arranged) coincides major side of the golden rectangle on which Alexander is depicted. **(Fig. 10)**

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