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## CONTRIBUTION TO THE STUDY OF ANCIENT COMPASSES WITH EXAMPLES FROM MACEDONIA

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**Key words:** compass, *circinus*, ancient tools, history of technology, *axis mundi*

**Abstract:** Presented within the article are direct and indirect archaeological evidence for the use of compasses on the territory of RN Macedonia during the period of antiquity. The article starts off with a short overview of the origins and development of the compass as a tool, before focusing on the specific specimens of ancient compasses discovered on the territory of RN Macedonia. The article also presents multiple examples pointing to the use of compasses in different spheres of ancient material culture from RN Macedonia, including architecture, stonemasonry, decoration of bone objects and mosaic design. The last part of the article is dedicated to the symbolic aspects of the compass, with a special emphasis on one of the Macedonian specimens.

When getting acquainted with the Antikythera mechanism or reading about the works of Heron of Alexandria, one cannot but wonder about all the possibly magnificent devices of technological innovation that the people of antiquity came up with. Such a find would be a once in a lifetime - “dream come true” - find for every archaeologist. But, the wonder and search for such exquisite examples of mechanical engineering (for their time of course) should not be a reason to neglect the study of their fairly less complex counterparts - the common tools and devices which did a lot more work in building civilization on a day-to-day basis. In fact, it should encourage it.

Geometry and the ability to precisely draw circular shapes and transfer lengths were as important to the development of civilization as fire itself. Without them, there would be no Parthenon, no Pantheon, no Age of Exploration, nor the Space Race - and all of that thanks to the simple tool which we call a compass i.e. pair of compasses.

### 1. Origins of the compass

According to Greco-Roman mythology, Perdix, the nephew of famed Daedalus, was the first “to bind two arms of iron together at a joint, so that, while the arms kept the same distance apart, one might stand still while the other should trace a circle”.<sup>1</sup> Indirect archaeological evidence pointing to the existence of some kind of hand tool which functioned as a compass can be traced back to the Bronze Age, including, but not limited to, the Indus Valley civilization, the Cycladic and Mycenaean cultures of the Aegean Sea and pre-Celtic Britain and Ireland.<sup>2</sup> However, it is fairly safe to assume that the first circle-drawing techniques used by man were developed much earlier in prehistory and probably included the use of two pegs and a string connecting them.

An interesting innovation in the prehistoric development of the compass is the so-called “multiple-brush compass”, which was used in the Aegean region for painting concentric circles and semicircles as part of pottery decoration. The first instances that point to the use of the multiple-brush compass can be dated back to the Bronze Age, although it would become much more widespread during later times in the Submycenaean and Protogeometric periods (i.e. Early Iron Age).<sup>3</sup> The Early Iron Age is the period when we also see the first instances of the compass-painted motifs of concentric circles and semicircles.

<sup>1</sup> Ovid, *Metamorphoses*, 8.247-49.

<sup>2</sup> In general: Gordon Childe 1954: 195 (Note: We do not agree with Gordon Childe’s derogatory use of terms such as “illiterate barbarians”). Indus Valley: Mackay 1938: 221-222. Aegean: Højrup 2000: 19-20, 29-30, 43-44. Ireland: Maryon 1938: 189.

<sup>3</sup> Højrup 2000: 19-20, 26, 43-44; Papadopoulos et al. 1998. Disagreement on the existence of the multiple-brush compass: Eiteljorg 1980.

cles on matt-painted pottery in Macedonia - both on imported and locally-produced specimens.<sup>4</sup>

In historical times, the classical Greek authors used three different words to denote the compass or some similar circle-drawing tool: *τορνος* (*tornos*), *καρκινος* (*karkinos*) and *διαβητης* (*diabētēs*).<sup>5</sup> For example, Herodotus, “The Father of History”, in an instance where he shares his discontent for the map-making habits of the day, used the term *τορνος* (*tornos*): “*And I laugh to see how many have ere now drawn maps of the world, not one of them showing the matter reasonably; for they draw the world as round as if fashioned by compasses (=ἀπὸ τὸρνον), encircled by the river of Ocean, and Asia and Europe of a like bigness.*”<sup>6</sup> Apropos, one of the several so-called “firing holes” on the famous Neo-Babylonian clay tablet depicting a circular map of the world (6th century BC, housed in the British Museum) is placed in the centre of the map and might have been left by the fixed leg of a compass, or a stylus that was used as such (in the “two pegs and a string” technique).<sup>7</sup>

The importance of the compass in the development of classical Greek culture can be best attested by the clearly visible compass marks that the builders of the Parthenon left on the stylobate and column drums of the temple.<sup>8</sup> However, physical examples of compasses from pre-Roman times are rare. As specimens from the Hellenistic period (3 - 2 century BC), we can point out the iron straight-legged compasses from the Epirote town of Antigonea (modern-day Albania)<sup>9</sup> and from Daorson, the eponymous capital of the Illyrian tribe Daorsi (modern-day Bosnia and Herzegovina).<sup>10</sup> The most archaeological data on the development and use of the ancient compass comes from the Romans, who, unlike the Ancient Greeks, used only one word for all the different types of compass-like tools they utilized - *circinus*.<sup>11</sup>

## 2. The Roman *circinus*

During Roman times, the compass was a widespread tool used by a variety of professions, including carpenters, stonemasons, architects, surveyors, cartographers, astronomers and artisans of any oth-

er kind. The specimens that have survived till today are usually made out of iron or bronze, although we should not exclude the possibility that there were also compasses made out of wood (which unfortunately did not endure the burden of time). Based on the shape of the legs and the way they were joint together, which in turn determined the function of the instrument, Roman compasses can be principally divided into three general groups: a) “*dividers*” - the usual compasses with straight legs connected at one end, which were used for transferring lengths and drawing circles; b) “*calipers*” - compasses with curved legs or points used for measuring external dimensions or interior openings of objects; and c) “*proportional dividers*” - compasses with straight legs connected at about two-thirds of their length, which were used for proportionally enlarging or reducing the dimensions of objects. Additionally, compasses can be further divided based on the existence of a mechanism for fixing the legs to a certain opening i.e. radius, usually located at their joint. In rare cases, there were also compasses of a more specific and complex design.<sup>12</sup>

Some of the earliest visual depictions of compasses from the Roman cultural sphere can be found on the silver denarii of L. Papius, minted in the year 79 BC. Namely, the pair of control marks on one type of his coins can be identified as “calipers with curved legs” (obverse) and “dividers with legs bent at a right angle” (reverse).<sup>13</sup> In another variant, the control mark on the obverse of the coin shows a compass with straight legs, paired with a drill on the reverse.<sup>14</sup> The straight-legged compass can be also seen as a control mark on the obverse of one coin type issued by L. Roscius Fabatus in 64 BC.<sup>15</sup> According to E. A. Sydenham, the control-marks on the coins of L. Papius and L. Roscius Fabatus denoted different trade-guilds (*collegia opificum*) in Rome, with the compasses being symbols that represented the guild of the carpenters.<sup>16</sup> M. H. Crawford does not agree with this interpretation and states that they are “*no more than a random selection of pairs of everyday objects.*”<sup>17</sup>

All three types of compasses depicted on the denarii of L. Papius have also been confirmed in the archaeological record, thanks to the excavations at Pompeii. This valuable site has yielded numerous

<sup>4</sup> Митревски 1991: 51; Папазовска-Санев 2015: 171. Examples: Паровић-Пешикан 1985: Т. III.

<sup>5</sup> Shelby 1965: 237.

<sup>6</sup> Herodotus, *The Histories*, 4.36

<sup>7</sup> For the object see: *Map of the World 2020*. For the interpretation of the hole as made by a compass leg see: Couprie 2011: 84.

<sup>8</sup> Lambrinou 2020.

<sup>9</sup> Budina 1972: 276, 302, Fig. 43: 4, Fig. 44.

<sup>10</sup> Marić 1979: 32, T. XXX: 119.

<sup>11</sup> This term is in turn derived from the Ancient Greek *καρκινος* (*karkinos*), literally meaning “crab”.

<sup>12</sup> General information on the Roman *circinus*: Smith 1859: 283; Daremberg & Saglio 1887: 1185-1186; Shelby 1965: 238; Di Pasquale 1994; Šeparović 2000; Ulrich 2007: 52-53.

<sup>13</sup> *L. Papius 2020a*; Crawford 1974: Plate LXVII: 163.

<sup>14</sup> *L. Papius 2020b*; Crawford 1974: Plate LXVII: 204.

<sup>15</sup> Crawford 1974: Plate LXIX: 158.

<sup>16</sup> Sydenham 1931.

<sup>17</sup> Crawford 1974: 398-399, 439-440.

specimens of compasses, which probably belonged to the many craftsmen that worked on the reconstruction of the city following the earthquake of 62 AD, before its tragic demise in the eruption of Vesuvius in 79 AD.<sup>18</sup> Speaking of Pompeii, we should also point out a fresco that adorned the façade of a carpenter's workshop. The fresco depicts a procession of carpenters carrying a platform with a canopy called a *ferculum*. Represented on the platform, from left to right, are the goddess Minerva (as patroness of crafts), three carpenters at work, and Daedalus holding a straight-legged compass in his right hand while standing over a dead body (presumably of his nephew Perdix, inventor of the compass, who was killed by Daedalus because of jealousy).<sup>19</sup>

Other visual representations of compasses can be seen on votive and funerary stone monuments throughout the Empire. One such example is the marble relief from Rome depicting a carpenter's workshop (probably once part of an altar dedicated to Minerva), which features a caliper with curved legs.<sup>20</sup> From Rome also comes a statue base dedicated to the forest god Silvanus, depicted on which are multiple tools used by builders in the Roman period, including a straight-legged compass.<sup>21</sup> A compass of the same type can also be seen on the funerary altar of Eutyches from Priolo in Sicily,<sup>22</sup> and on the mausoleum of L. Alfius Staius from Aquileia.<sup>23</sup>

However, the most direct archaeological resource for the study of Roman compasses are the tools themselves, which have been found throughout the territory that was once the Roman Empire. This also includes the Balkan Peninsula, where numerous compasses from the Roman period have been discovered - from modern-day Greece in the south, to Slovenia in the north.<sup>24</sup> In the following paragraphs, we will focus our attention to the Roman compasses discovered on the territory of RN Macedonia.

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<sup>18</sup> Di Pasquale 1994.

<sup>19</sup> Ulrich 2007: 44-45, Fig. 3.33; Beard 2008: 294-295, Plate 5.

<sup>20</sup> Ulrich 2007: 52, Fig. 2.3, Fig. 3.36.

<sup>21</sup> Ulrich 2007: Fig. 3.42.

<sup>22</sup> Ulrich 2007: 31, Fig. 3.21.

<sup>23</sup> Cohon 2010: Pl. 19, 3.

<sup>24</sup> Greece: *Marousi 2009; Dion 2012*; Bulgaria: *Shumen 2019; Augusta Traiana 2019*; Serbia: *Јеремиић 2014; Požarevac 2019*; Bosnia and Herzegovina: *Busuladžić 2015: 45-46, 161, 260, Tabla 31*; Croatia: *Dimitrijević 1979: 172, T.18/2; Šeparović 2000*; Slovenia: *Horvat 1995: 186, T. 10: 6; Gaspari et al. 2000: 192, Fig. 7: 11; Pflaum 2007: 288, 304, Pl. 4: 30; Sagadin 2015: 53, Tab. 2: 19.*

### 3. Roman compasses from Macedonia

#### 3.1. A bronze compass from Prilep

The only Roman compass that has so far been published in Macedonian archaeological literature is a bronze specimen that was discovered in 1961 at the site of Tašačitsa, locality Varosh, in the immediate vicinity of the city of Prilep (T.I: 1).<sup>25</sup> The archaeological site of Tašačitsa is described as a Late Antique necropolis and settlement. Excavated at the necropolis were 47 inhumation graves with a west - east orientation, containing skeletons laid on their backs in an outstretched position. The archeologists encountered two different types of grave constructions: graves outlined and covered with stone slabs (or marble slabs in rare cases) and graves of the "Cappuccina" type, constructed out of tegulae and imbrices forming a pitched roof. A large portion of the graves were without any grave goods, while others contained pottery, jewelry (such as bronze crossbow fibulae) and other personal items such as a bone comb and the bronze compass of our interest. The necropolis also yielded eight coins, only three of which were readable and could be dated to the time of emperors Constantine I, Constantius II and Flavius Victor (4th century AD).<sup>26</sup> The compass, which is now housed in the Prilep Museum, was discovered in Grave 31 of the necropolis. Precise information on the archaeological context of the specific grave has not been published.

The compass is constructed out of two straight legs with a length of 15.5 centimeters, which are connected at one end by a rivet and sharpened at the other (T.I: 1). The joint of the legs i.e. head of the compass has a hemispherical shape on one side, while on the other is a simple mechanism for fixing the radius of the compass. The mechanism consisted out of an elongated, thin flat piece with a gradually narrowing width, which is inserted into a hole in the extended rivet connecting the legs.

The compass from Prilep is beautifully decorated. The hemispherical side of the head is decorated with radial incisions forming a rosette-like motif. The legs, from the head downwards, are divided into four rectangular zones depicting different motifs in relief, after which comes a continuous herringbone pattern incised down to the sharpened points. The motifs depicted in the four rectangular zones, in order from the top, can be described as resembling a column, a fish, a tree, and another fish (T.I: 1, 2).<sup>27</sup>

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<sup>25</sup> Kepeski 1969; Кепески 1980.

<sup>26</sup> Babić 1961; Бабиќ & Китановски 1996.

<sup>27</sup> For a similar interpretation of the motifs see: *Јеремиић 2014: 34.*

### 3.2. A bronze compass from Stobi

Another bronze compass, unpublished until now, has been discovered in 1995 at the Western necropolis of the Roman municipium Stobi, in excavations conducted by the National Conservation Centre (T.I: 3). The compass is now part of the collection of the National Institution Stobi.

The compass was found as a grave good in an inhumation burial numbered as Grave 1216 (T.I: 5, 6). A large portion of the grave was devastated in Roman times by later graves, making it impossible to determine its exact construction, although it probably was a simple grave pit of rectangular shape. The orientation of the grave is southwest - northeast. Remaining of the skeleton of the deceased, who was probably laid in an outstretched position, are only the leg bones from the knees downwards (the left tibia and fibula, the right fibula and parts of both feet). The bronze compass was deposited besides the feet, alongside a ceramic oil lamp and a ceramic pot (T.I: 6).<sup>28</sup>

The compass is made out of two straight legs with a length of 15.7 centimeters, connected at one end by a rivet and sharpened at the other (T.I: 3). At about 3.5 and 8 centimeters from the top of the compass, the legs have lateral indentations which form one column-like and one hourglass-shaped motif respectively, both of which have their ends marked off by two incised horizontal lines. The upper part of the legs has a rectangular cross-section that transforms into a trapezoid cross-section after the hourglass-shaped motif, which then narrows down to a triangular cross-section at the points. At about half length of the lower, trapezoid/triangular part of the legs, there is a short rectangular broadening with three incised horizontal lines. The head of the compass on one side is of hemispherical shape and decorated by radial incisions. On the other side of the head is a mechanism for fixing the opening of the legs, analogous to the compass from Prilep - an elongated, thin flat piece whose width gradually narrows, which goes into the rivet that connects both legs (T.I: 4).

The ceramic oil lamp found alongside the compass has a round body with a heart-shaped nozzle (T.I: 8). Its shoulder is relatively narrow and decorated with an *ovolo* (egg-shaped) pattern, while the discus depicts an erotic scene. The lamp is fired red and coated with a quality red slip. Based on its characteristics, the lamp belongs to Type XXXVIII, Variant B according to the typology of ancient oil lamps from Macedonia by A. Jakimovski, dating it to the first half of the 2nd century AD.<sup>29</sup>

<sup>28</sup> ДИМИТРОВСКА 2020: 115, 119.

<sup>29</sup> ЈАКИМОВСКИ 2008: 281-284. The specific lamp is published under Cat. No. 396.

The other preserved ceramic artifact deposited in Grave 1216 is a cooking pot with two vertical handles extending from just below rim to the widest part of the body (T.I: 7). Based on analogies, its form is somewhere between that of a similar, albeit quite larger pot discovered in the cremation Grave 39 from the same Western necropolis at Stobi, dated to the late 1st - early 2nd century AD,<sup>30</sup> and the fragmented specimens belonging to Form 4 of the Middle Roman cooking wares from Stobi according to V. Anderson-Stojanović, dated to the 2nd - 3rd centuries AD.<sup>31</sup>

Based on the proposed dates for the oil lamp and the cooking pot, the inhumation burial Grave 1216, together with the bronze compass of our interest, can be dated to the 2nd century AD. This is quite interesting because it puts Grave 1216 among the early inhumation graves at the Stobi necropolis. Namely, during the 2nd century AD, the practice of inhumation started sweeping the Roman Empire, replacing cremation as the preferred funeral rite - a transformation that was largely completed in the following 3rd century.<sup>32</sup> According to some archaeologists, this funerary trend was spread throughout the Empire (or its spreading was catalyzed) by traveling professionals such as soldiers, merchants and craftsmen, mainly coming from Eastern provinces.<sup>33</sup> Maybe the deceased of Grave 1216 was one of those craftsmen, or simply a local that accepted the cultural changes of his time.

### 3.3. An iron compass from Smokvitsa

During the rescue excavations alongside the highway Corridor 10, between the towns of Demir Kapija and Gevgelija, archaeologists managed to discover and excavate multiple sites of different chronological affiliation. One of them was the site St. Elijah - Piut, west of the village of Smokvitsa, Municipality of Gevgelija. The results of the excavation have not been published, with the exception of some general information published in an online article by news outlet "Dnevnik".<sup>34</sup> According to the article, archaeologists at the site discovered remains of a Roman settlement and necropolis. The settlement was supposedly active from the 1st century BC, to the end of the 2nd century AD. The archaeologists also excavated a total of 16 graves, divided into two sectors (seven and nine graves accordingly). Some of the

<sup>30</sup> Wiseman & Mano-Zissi 1972: 414, Fig. 20; Anderson-Stojanović 1992: 135, No. 1158, Plate 134: 1158.

<sup>31</sup> Anderson-Stojanović 1992: 136, No. 1173-1175, Plate 136: 1173-1175.

<sup>32</sup> General discussion on the topic: Morris 1992: 42-69.

<sup>33</sup> ЈОВАНОВИЋ 1984: 158; ЈОВАНОВА 2013: 874.

<sup>34</sup> *Smokvitsa 2013*.

<sup>35</sup> *Shumen 2019*.

graves were cremations, while others were inhumations. The graves contained different grave goods, including coins from the 2nd and 3rd centuries AD, as well as an iron compass that was later deposited in the Gevgelija Museum. The compass was specifically described in the article as a “builder’s compass”, which gives us reason to assume that it was of larger dimensions compared to the previously discussed bronze specimens - maybe similar to the large iron compass discovered at Shumen in Bulgaria during the 2019 excavations.<sup>35</sup>

#### 4. Evidence of ancient compass use from Macedonia

##### 4.1. The Palace at Bylazora

One of the best examples indicative of compass use during Macedonian antiquity does not come from Roman times, but much earlier - from the Classical period (5th - 4th centuries BC). Discovered among the ruins of the “Royal Palace” at the Paeonian capital of Bylazora (near the modern-day village of Knežje, Sveti Nikole) were several architectural elements that show signs of compass use. One limestone Doric capital with a fluted neck, documented as Block M22.S14, has several incised circles on its bottom (T.II: 1), while in the centre of two fluted column drums, documented as Block M22.S13 and Block M22.S15, are small holes left by the fixed end of a compass. Blocks M22.S14 and M22.S15 also show traces of straight lines that were probably incised during the process of fluting.<sup>36</sup>

The Roman author Vitruvius in later times gives a precise description of a fluting technique for Doric columns that employs the help of a compass: “*The columns should be fluted with twenty flutes. If these are to be left plane, only the twenty angles need be marked off. But if they are to be channelled out, the contour of the channelling may be determined thus: draw a square with sides equal in length to the breadth of the fluting, and centre a pair of compasses in the middle of this square. Then describe a circle with a circumference touching the angles of the square, and let the channellings have the contour of the segment formed by the circumference and the side of the square. The fluting of the Doric column will thus be finished in the style appropriate to it.*”<sup>37</sup>

Another architectural block from Bylazora, this time a cornice fragment, features a carved six-petal rosette (T.II: 2)<sup>38</sup> - a motif designed by the division of a circumference in six equal parts using a compass with the exact same radius of the circumference it-

self, thus creating additional six circumferences that touch the center of the original circumference (T.II: 5). This design is so indicative of compass use (or a technique imitating its movement), that in some South Slavic languages the word for a pair of compasses is derived from the word denoting the number six (*šest*) - *uemap/šestar* in Macedonian, Serbian and Croatian; *šestilo* in Slovenian.<sup>39</sup> Even one of the earliest examples of compass use from the Aegean are the gold roundels with a six-petal rosette from Shaft grave 3, Grave circle A in Mycenae (16th century BC), which have a small impression in the centre that was left by the fixed leg of a compass.<sup>40</sup> Having in mind that the builders of the “Royal Palace” at Bylazora undoubtedly utilized the compass, as evidenced by the incisions on the previously mentioned architectural blocks, it can be assumed that they also used a compass to design the six-petal rosette on the cornice block. In fact, we can see the same six-petal rosette motif on a stone mortarium also discovered at Bylazora, this time featuring in its center a clearly visible hole left by the compass that was used to design it (T. II: 3).<sup>41</sup> To round everything up in compass fashion, Bylazora has also given archaeologists an unidentified, highly corroded and fragmented iron tool with a length of about 15 centimeters, comprised out of two legs that are connected at one end (T.II: 4).<sup>42</sup> Could this have been one of the compasses used by the builders of Bylazora?

##### 4.2. Roman funerary stelae

Commenting on the aesthetics of a Roman funerary stele from the 3rd century AD discovered at the village of Lopate (near today’s Macedonian city of Kumanovo and once part of the Roman province of Moesia Superior), M. Šašel Kos notes that the “*particularly elaborate*” rosette carved in its tympanum “*must have been carefully made with a pair of compasses*” (T.II: 6).<sup>43</sup> Indeed, it is hard to imagine that the stonecutter of this monument achieved the geometrically regular design of overlapping circles without the help of a compass. It is also fairly safe to assume that the compass was a regular tool in stonecutters’ workshops throughout the Empire, and a good portion of the different circular and rosette designs adorning Roman funerary monuments were probably created with its help.

<sup>39</sup> On the symbolic and mythological aspects of the six-petal rosette in Slavic cultures see: Чаусидис 1994: 405-409; Чаусидис 2017: 751-754.

<sup>40</sup> Højrup 2000: 29-31.

<sup>41</sup> *Bylazora Finds 2008*.

<sup>42</sup> *Bylazora Finds 2008*.

<sup>43</sup> Šašel Kos 2012: 517; For the monument itself see: IMS VI: No. 227; Петковски 2013: No. 98.

<sup>36</sup> Egerer 2010: 20-21, 31-32.

<sup>37</sup> Vitruvius, *De architectura*, 4.3.9.

<sup>38</sup> *Bylazora 2013*.

In fact, rosette motifs are some of the most common visual elements on Roman funerary monuments from the territory of RN Macedonia,<sup>44</sup> and researchers have proposed the existence of multiple Roman stonecutters' workshops on its territory, both in urban and rural areas, together with the existence of traveling stonecutters.<sup>45</sup> Hopefully, future archaeological excavations will reveal these workshops and give us a better understanding of the tools that were utilized in their work.

At least two local stonecutters' workshops have been proposed to exist in the Tikveš region,<sup>46</sup> where they produced a unique group of funerary monuments conventionally named by researchers as the "Kavadarci group" or "Tikveš group". In regards to the previous discussion of the six-petal rosette and its inherent connection to the compass, it is interesting to point out that the monuments of the "Tikveš group" feature this motif quite extensively (T.II: 7, for example).<sup>47</sup>

#### 4.3. A rectangular weaving tablet from Stobi

For our third example of ancient compass use from Macedonia we move away from the large stone blocks of monumental architecture and funerary monuments, and direct our attention towards a small object of everyday life - a rectangular bone tablet used for weaving (T.III: 1), published by Z. Kovancaliev in his thorough study of the bone objects for textile production from Stobi.<sup>48</sup>

The tablet, dated widely from the 1st - 4th century AD, was discovered at the Western necropolis at Stobi in 1992. The object has a diagonal length of 4.5 centimeters. It is quite damaged and one of its angles is broken off. Both sides of the rectangular bone tablet are decorated with incised motifs. One side is decorated with diagonally crossed lines and small concentric circles with a dot in the middle, while the other side features a design of overlapping circles, which was probably made by means of a compass (T.III: 1).<sup>49</sup> As an analogy for this specimen and its decoration of overlapping circles, Z. Kovancaliev points to another bone tablet discovered at Novae in Bulgaria.<sup>50</sup> The

same pattern of overlapping circles can also be seen on multiple Roman mosaics from Macedonia, including Stobi (T.III: 2), which brings us to our next practical example of ancient compass use.

#### 4.4. Roman mosaics

The repertoire of geometrically complex and precise designs commonly featured on Roman mosaics have led researchers to believe that the compass was an integral part of the mosaicists' tool kit, especially in the process of designing and layout planning of the mosaics.<sup>51</sup> And when it comes to beautifully constructed mosaics that are rich in geometrical patterns - Macedonia has plenty to offer. The mosaics at Stobi, Scupi, Heraclea Lyncestis, Lychnidos and other sites offer researchers insight into a plethora of different motifs and designs that affirm the prowess of their makers.

As indicative of compass use, for example, the previously discussed six-petal rosette can be seen at Stobi on the floor mosaics of the Old Episcopal Basilica (first phase, 4th century AD) and Synagogue II (4th century AD) (T.III: 7).<sup>52</sup> However, some of the geometrically more impressive examples of compass-created motifs can be seen on the later, second phase mosaic floor of the Old Episcopal Basilica at Stobi, constructed at the end of the 4th century AD or the beginning of the 5th century AD.<sup>53</sup> Even in the early stages of the archaeological excavations, R. Kolarik observed that this mosaic is technically more accomplished than the earlier mosaics at Stobi. The author comments that even the floral designs, although suggesting organic forms, are "*rigidly geometrical in composition*", further describing that "*their stems are based on tangent circles and combined with hearts formed of compass drawn arcs*" (T.III: 4).<sup>54</sup> The described mosaic is in fact a more elaborate form of the basic square grid of overlapping circles i.e. two overlapping square grids of tangent circles (T.III: 3).

Different variants of the square grid of overlapping circles can be commonly seen on mosaics and other objects of the Roman period, such as the previously noted rectangular weaving tablet from Stobi (T.III: 1, 2). The design, in various forms, is present on multiple mosaics at archaeological sites located on the territory of RN Macedonia, including Stobi, Scupi (T.III: 5), Heraclea Lyncestis (T.III: 6), the Ro-

<sup>44</sup> Петковски 2013: 66-77.

<sup>45</sup> Проева 1986; Šašel Kos 2012; Јованова 2013: 895.

<sup>46</sup> Проева 1986: 60.

<sup>47</sup> Чаусидис 2003: T. VIII, T. IX: 4, 9. The author proposes several possible Manichean symbolic interpretations of the motif within the context of the "Tikveš group" (Чаусидис 2003: 57-62).

<sup>48</sup> Кованцалиев 2014: 70-71, 117-118, T. X: 56.

<sup>49</sup> Кованцалиев 2014: 117.

<sup>50</sup> Кованцалиев 2014: 71; Владкова 2006: 264-265, T. III: 1; Владкова 2012: 216, Plate IV: 27.

<sup>51</sup> Dunbabin 1999: 282.

<sup>52</sup> On the Old Episcopal Basilica see: Алексова 1985. On the Synagogue see: Мое 1977. On the mosaics see: Kolarik 1987.

<sup>53</sup> Алексова 1985; Kolarik 1987.

<sup>54</sup> Kolarik 1980: 183-184.

man villa at Valandovo and others.<sup>55</sup> It can also be seen on the earliest Roman mosaic so far discovered on the territory of RN Macedonia at Lychnidos (today's Ohrid), dated to the end of the 1 century BC or beginning of the 1 century AD (T.III: 8).<sup>56</sup>

## 5. Symbolic aspects of the compass

In the moment when a compass is deposited within a grave, it becomes a symbolic object signifying an important aspect of the deceased's former life and identity (as a craftsman, architect, artist etc.). In fact, one could successfully argue that material culture always has a certain symbolic quality attached to it, whether it be recognized or unrecognized, conscious or unconscious. In this section we will explore the possibility of certain cosmological symbolic values attached to the compass.<sup>57</sup>

This discussion was prompted by the existence of the medieval Christian concept of God as "The Great Architect", manifested in the pictorial form as God creating the cosmos by using a pair of compasses.<sup>58</sup> We should also not forget that besides being the Son of God and God Himself, Jesus the Man was a carpenter - a profession that extensively utilized the compass and might have even identified with the tool during Roman times, as we have seen before. The idea of God as a compass-wielding "Great Architect" was later carried on into the repertoire of symbols of the Masonic lodges, where it continues to be used to this day. But, the "Great Architect" i.e. the fashioner of the world as a craftsman is not an idea exclusive to the Masons, Christianity or the Medieval Period. Similar ideas, albeit unique in their own manner and cultural context, can be found in many more ancient cultures around the world. Such is the Demiurge of Plato's *Timaeus* and the ancient Gnostic traditions, whose name/title literally means "craftsman" i.e. "constructor" in Ancient Greek (δημιουργός/dēmiurgós).<sup>59</sup> There is also Viśvakarman of Vedic and Hindu mythology - early on comprehended as the all-seeing, all-powerful creator of the world analogous to mighty deities such as Indra, Sūrya, Prajāpati and the later Brahmā, for in later times to be reduced

to the role of "great builder of celestial palaces and kingdoms."<sup>60</sup> Even the modern science-fiction concept of the observable universe as an artificial simulation created by some "computer programmer" (vulgarly described), is no more than another manifestation of the same archetypal paradigm - that the world is an artifact created in a similar manner as objects of material culture are created by skilled artisans.

In fact, it is not hard to evoke the image of the "Great Architect" when visualizing Herodotus' account of cartographers drawing maps of the world "as round as if fashioned by compasses"<sup>61</sup> - especially when having in mind that the majority of mythological and theoretical concepts of Ancient Greek cosmology envisioned the world as either circular or spherical.<sup>62</sup> Even Plato's own "Great Architect" figure, the Demiurge, fashions a round world: "And he bestowed on it the shape which was befitting and akin. Now for that Living Creature which is designed to embrace within itself all living creatures the fitting shape will be that which comprises within itself all the shapes there are; wherefore He wrought it into a round, in the shape of a sphere, equidistant in all directions from the center to the extremities, which of all shapes is the most perfect and the most self-similar, since He deemed that the similar is infinitely fairer than the dissimilar. And on the outside round about, it was all made smooth with great exactness, and that for many reasons."<sup>63</sup>

Fast forward to Roman times and the writings of Vitruvius, we can clearly see the incorporation of mythological and theoretical concepts about the cosmos within practical, architectural activities that made extensive use of the compass as a tool. Such is the example with Vitruvius' plan of the ideal city, designed in accordance to the eight cosmological winds: "In the middle of the city place a marble amussium, laying it true by the level, or else let the spot be made so true by means of rule and level that no amussium is necessary. In the very centre of that spot set up a bronze gnomon or shadow tracker. At about the fifth hour in the morning, take the end of the shadow cast by this gnomon, and mark it with a point. Then, opening your compasses to this point which marks the length of the gnomon's shadow, describe a circle from the centre. In the afternoon watch the shadow of your gnomon as it lengthens, and when it once more touches the circumference of this circle and the shadow in the afternoon is equal in length to that of the morning, mark it with a point. From these two points describe with your compasses intersecting

<sup>55</sup> Stobi: Kolarik 1981, Kolarik 1987, Алексова 1985; Heraclea Lyncestis: Манева 1987: Сл. 6; Scupi: Кораќевик 1977: Сл. 2; Valandovo: Шурбаноска 1993: Сл. 2.

<sup>56</sup> Јованова 2013: 897.

<sup>57</sup> On the general symbolic meanings of the compass see: Chevalier & Gheerbrant 1990: 273-275.

<sup>58</sup> Friedman 1974.

<sup>59</sup> Plato, *Timaeus*, 29e-37c; Cornford 1997: 33-39. On the Demiurge in Gnostic cosmologies see: Rudolph 1983: 67-87.

<sup>60</sup> Macdonell 1897: 130; Williams 2003: 299-300.

<sup>61</sup> Herodotus, *The Histories*, 4.36.

<sup>62</sup> Aujac et al. 1987; Couprie 2011.

<sup>63</sup> Plato, *Timaeus*, 33b.

arcs, and through their intersection and the centre let a line be drawn to the circumference of the circle to give us the quarters of south and north. Then, using a sixteenth part of the entire circumference of the circle as a diameter, describe a circle with its centre on the line to the south, at the point where it crosses the circumference, and put points to the right and left on the circumference on the south side, repeating the process on the north side. From the four points thus obtained draw lines intersecting the centre from one side of the circumference to the other. Thus we shall have an eighth part of the circumference set out for Auster and another for Septentrio. The rest of the entire circumference is then to be divided into three equal parts on each side, and thus we have designed a figure equally apportioned among the eight winds. Then let the directions of your streets and alleys be laid down on the lines of division between the quarters of two winds.”<sup>64</sup>

A semiotic analysis of the described city design reveals it to be a microcosmic projection of the macrocosmos - a theme consistent within the context of Vitruvius' writings, also evident in his description of the ideal human body proportions “so designed by nature”.<sup>65</sup> Of utmost importance in this relation is the center, marked by the gnomon i.e. starting point of the compass in the city plan (practically the point of intersection of the *decumanus maximus* and *cardo maximus*) and the navel in human beings: “Then again, in the human body the central point is naturally the navel. For if a man be placed flat on his back, with his hands and feet extended, and a pair of compasses centred at his navel, the fingers and toes of his two hands and feet will touch the circumference of a circle described therefrom. And just as the human body yields a circular outline, so too a square figure may be found from it. For if we measure the distance from the soles of the feet to the top of the head, and then apply that measure to the outstretched arms, the breadth will be found to be the same as the height, as in the case of plane surfaces which are perfectly square.”<sup>66</sup>

The paradigmatic city plan of Rome itself is based on the symbolic tenets of the center and the “squaring of the circle” i.e. the *Roma quadrata* with its *mundus*. The Roman *mundus*, as the name suggests, was symbolically viewed as the center of the world, once again completing the symbolic relation of microcosmos - macrocosmos. The center is in fact the point

from which all creation begins and is perceived as the most sacred spot in the universe.<sup>67</sup>

With this symbolic concept in mind, and taking into account the largely subconscious nature of mythical thinking, it is not hard to understand how the compass, being the tool used by architects to start the creation of the city plan from its center (or cartographers to draw up a round map of the world), eventually became the “tool-of-choice” for the “Great Architect” to bring the universe and cosmic order into existence. The compass was no longer just a means of creation, but also the central point around which the creation was constructed. In such a mythical image, the vertical fixed leg of the compass in the sacred center of the world takes on the role of *axis mundi* - the world axis. In world mythologies, the concept of the *axis mundi* usually manifests itself in a specific, axial symbolic form such as a cosmic column, tree, mountain, tower, ladder, staircase, rope or similar, connecting Earth with the Heavens.<sup>68</sup>

Vitruvius also refers to the world axis when defining the word “universe” in his Ninth book focusing on astronomy and sundials: “The word ‘universe’ means the general assemblage of all nature, and it also means the heaven that is made up of the constellations and the courses of the stars. The heaven revolves steadily round earth and sea on the pivots at the ends of its axis. The architect at these points was the power of Nature, and she put the pivots there, to be, as it were, centres, one of them above the earth and sea at the very top of the firmament and even beyond the stars composing the Great Bear; the other on the opposite side under the earth in the regions of the south. Round these pivots as centres, like those of a turning lathe, she formed the circles in which the heaven passes on its everlasting way. In the midst thereof, the earth and sea naturally occupy the central point.”<sup>69</sup> This definition of the universe is preceded and prompted by a paragraph discussing sundials, which ends with a quite interesting and indicative sentence: “It is due to the divine intelligence and is a very great wonder to all who reflect upon it, that the shadow of a gnomon at the equinox is of one length in Athens, of another in Alexandria, of another in Rome, and not the same at Piacenza, or at other places in the world. Hence drawings for dials are very different from one another, corresponding to differences of situation. This is because the length of

<sup>64</sup> Vitruvius, *De architectura*, 1.6.6-7. The author gives a more technical description in paragraphs 1.6.12-13.

<sup>65</sup> Lagopoulos 2009. On the ideal human proportions: Vitruvius, *De architectura*, 3.1.2-3.

<sup>66</sup> Vitruvius, *De architectura*, 3.1.3.

<sup>67</sup> On the symbolism of the center and the relation city-cosmos see: Eliade 1963: 36-50. On the *Roma quadrata* as adhering to these principles: Eliade 1963: 47; Kerényi 2002: 12-14.

<sup>68</sup> Eliade 1963: 36-42; Chevalier & Gheerbrant 1990: 90-92; Чаусидис 2005: 21, 363-364.

<sup>69</sup> Vitruvius, *De architectura*, 9.1.2.



*the shadow at the equinox is used in constructing the figure of the analemma, in accordance with which the hours are marked to conform to the situation and the shadow of the gnomon. The analemma is a basis for calculation deduced from the course of the sun, and found by observation of the shadow as it increases until the winter solstice. By means of this, through architectural principles and the employment of the compasses, we find out the operation of the sun in the universe.*<sup>70</sup>

Within this context we also revisit the compass from Prilep and its unique decoration. As we discussed previously, the motifs adorning this particular bronze compass, from the top downwards, can be described as resembling a rosette, column, fish, tree, another fish and a continuous herringbone pattern. In the order of these motifs we can recognize a vertical symbolic projection of the cosmic zones (T. I: 2).<sup>71</sup> The rosette at the top, based on its spatial positioning and visual resemblance to the Sun, can be interpreted as signifying the Sky i.e. Heaven as the upper cosmic zone. The column and tree motifs are symbols *par excellence* of the *axis mundi* and the middle cosmic zone i.e. Earth, while the two fish motifs signify water i.e. the Sea and the lower cosmic zones. The continuous herringbone pattern in the lower part of the legs could be a case of *horror vacui*, which at the same time effectively emphasizes the axial symbolism of the compass legs (maybe even alluding to tree branches or fish bones as symbols of Earth and Sea?). The alternation of the axial symbols (column and tree) and the two fish may be a simple case of doubling the vertical symbolic projection of the cosmos, or it might also have an intended symbolic meaning, signifying the intertwinement of Earth and Sea. We find direct reference to the cosmic image of Earth and Sea occupying the centre of the universe in the previously cited paragraph by Vitruvius where he defines the universe: “*The heaven revolves steadily round earth and sea on the pivots at the ends of its*

*axis*” and “*Round these pivots as centres, like those of a turning lathe, she [Nature] formed the circles in which the heaven passes on its everlasting way. In the midst thereof, the earth and sea naturally occupy the central point.*”<sup>72</sup>

Could it be the case that the manufacturer of the compass from Prilep was familiar with the writings of Vitruvius? Maybe he was an architect or craftsman that also constructed sundials? We will probably never truly know. But, it is interesting to point out that Pelagonia, the region to which Prilep belongs, had a tradition of stonecutting and sundial construction during Roman times. This was mainly due to the vicinity of the large marble quarry Sivets near Prilep that was also active in the Roman period.<sup>73</sup> One Early Roman sundial made out of Sivets marble was discovered at the site of Gradište - Debrešte near Prilep.<sup>74</sup> A marble sundial base with a Latin inscription dated to the year 10 AD has also been discovered at Heraclea Lyncestis - a Roman town belonging to the same region of Pelagonia.<sup>75</sup> Maybe the deceased from Grave 31 at Tašačitsa-Prilep was a Late Antique follower of an already established Pelagonian tradition of stonecutting and sundial production? It is an interesting possibility to think about in any case.

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I would also like to encourage my colleagues from other archaeological institutions and museums in Macedonia to look into their respective depots and bring forward to the public any ancient compasses that may have been deposited therein.

<sup>70</sup> Vitruvius, *De architectura*, 9.1.1.

<sup>71</sup> On vertical symbolic projections of the cosmos see: Чаусидис 2005: 18-23, 46-90.

<sup>72</sup> Vitruvius, *De architectura*, 9.1.2.

<sup>73</sup> Керамидчиев 1987.

<sup>74</sup> Кепески 1983.

<sup>75</sup> Јанакиевски 1971.

## ПРИЛОГ КОН ПРОУЧУВАЊЕТО НА АНТИЧКИТЕ ШЕСТАРИ СО ПРИМЕРИ ОД МАКЕДОНИЈА

### Резиме

Во трудот се презентираат директни и индиректни археолошки докази за употребата на шестари на територијата на РС Македонија во текот на античкиот период. Трудот опфатнува со краток осврт врз потеклото и развојот на шестарот како алатка, од предисторијата, па сè до крајот на антиката. Погледно внимание е посветено на римскиот период како епоха во која античкиот шестар ја достигнува својата најголема технолошка разновидност и најширока професионална примена. Притоа, во трудот се прави и краток библиографски преглед во однос на откриените шестари од предримскиот и римскиот период на Балканскиот Полуостров, пред фокусот да биде насочен кон примерите од Македонија.

Како конкретни примери на антички шестари кои потекнуваат од територијата на РС Македонија се посочуваат три примероци од римскиот период, два бронзени и еден железен, откриени на локалитетите Ташачица кај Прилеп, Стоби кај Градско и Св. Илија - Пиут кај Смоквица, Гевге-

лиско. Во продолжението на трудот се презентираат и неколку примери за употребата на шестари во различни сфери на античката материјална култура на територијата на РС Македонија, вклучувајќи ја раноантичката архитектура во Биласора, каменорезбарството на надгробни стели во римскиот период, декорацијата на коскени предмети и дизајнирањето на мозаични мотиви.

Последниот дел од трудот е посветен на симболичките аспекти на шестарот и неговата инкорпорација во космогониските митски парадигми со занаетчиски предзнак, каков што е случајот со митско-симболичкиот концепт за „Големиот Архитект“. Посебно внимание е посветено на релјефните мотиви прикажани на шестарот од Ташачица, Прилепско, чија анализа и споредба со пишувањата на римскиот автор Витрувиј покажуваат одредена поврзаност со концептот за „космичката оска“ и вертикалните симболички проекции на вселената.

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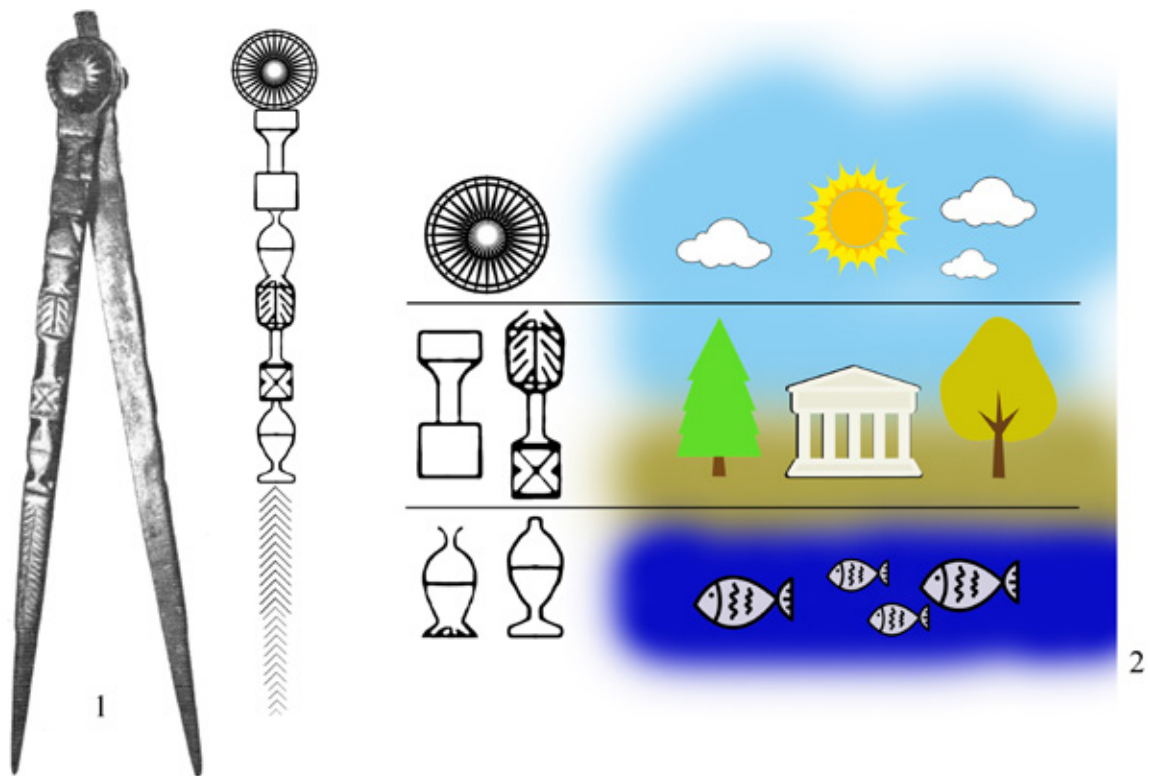
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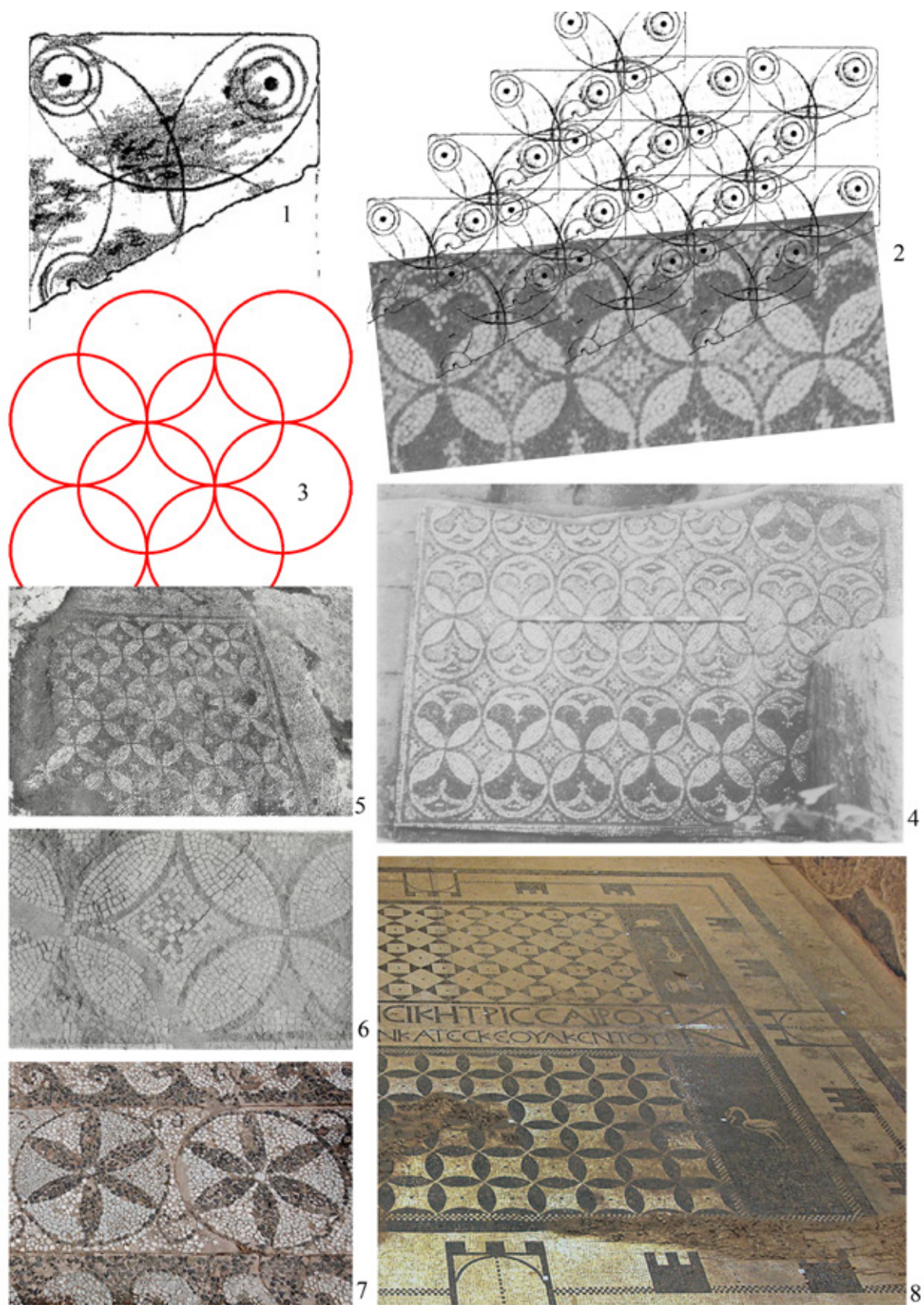
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T.I: 1 - Compass from Tašačitsa - Prilep, Late Antiquity (Photo: Kepeski 1969; Drawing: I. Eftimovski); 2 - The motifs on the compass from Prilep as symbols of cosmological zones; 3 - Compass from Grave 1216 at Stobi, 2nd century AD (Photo: NI Stobi/J. Radnjanski); 4 - Fixing mechanism of the compass from Stobi (Photo: NI Stobi/J. Radnjanski); 5, 6 - Grave 1216 from the Western necropolis at Stobi (Photo: NI National Conservation Centre; Drawing: V. Kolekjeski; Source: Димитровска 2020); 7 - Ceramic pot from Grave 1216 at Stobi (Photo: NI National Conservation Centre/Димитровска 2020); 8 - Ceramic oil lamp from Grave 1216 at Stobi (Drawing: Јакимовски 2008).



T.II: 1 - Column drum Block M22.S14 from Bylazora (Photo: Egerer 2010); 2 - Six-petal rosette on a cornice fragment from Bylazora (Photo: TFAHR/Bylazora 2013); 3 - Stone mortarium from Bylazora (Photo: TFAHR/Bylazora Finds 2008); 4 - Unidentified iron tool from Bylazora (Photo: TFAHR/Bylazora Finds 2008); 5- Construction of the six-petal rosette by using a compass; 6 - Roman funerary stele from Lopate (Photo: Mladenović 2016); 7 - Roman funerary stele from the Tikveš region (Photo: Јованова 2013).



T.III: 1 - Bone weaving tablet from Stobi (Drawing: Кованцалиев 2014); 2 - Pattern of overlapping circles on the weaving tablet from Stobi and the second phase mosaics of the Old Episcopal Basilica at Stobi (Weaving tablet: Кованцалиев 2014; Mosaic: Kolarik 1987); 3 - Construction of the square grid of overlapping circles; 4 - Second phase floor mosaic of the Old Episcopal Basilica at Stobi (Photo: Kolarik 1987); 5 - Mosaic floor of the Early Christian Basilica I at Scupi (Photo: Кораќевик 1977); 6 - Mosaic motif from the Early Christian "Extra Muros" Basilica at Heraclea Lyncestis (Photo: Манева 1987); 7 - Six-petal rosette on the floor mosaic of the Synagogue at Stobi (Photo: NI Stobi/Stobi Synagogue 2013); 8 - Early Roman floor mosaic from Lychnidos (Photo: Јованова 2013).