

# The Gold of Phanagoria (Bosporan Kingdom): A Complex Archaeo-metallurgical Study

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## Gold Objects in the Context

Phanagoria, founded ca. 543 BC, took its name after one of the colonists from Teos, Phanagoras and was the Asian capital of the Bosporan Kingdom and a large emporium for all the traffic between the coast of the Maeotian marshes and the countries on the southern side of the Caucasus (fig. 1, 1).<sup>1</sup> At least 1300 burials were excavated in the necropoleis since the first half of the 19<sup>th</sup> century, which are situated along the main roads leading from the city, and 78 of them contained gold objects (fig. 1, 2).<sup>2</sup>

The study of the gold objects from the excavations and chance finds of Phanagoria was undertaken in 2013–2014.<sup>3</sup> There are ca. 300 individual finds and groups of objects, dating from the late 4<sup>th</sup> century BC to the 5<sup>th</sup> century AD, which are kept in four institutions in Russia. Of these, 164 objects were analysed with the help of 284 RFX-analyses, while 67 samples were studied optically. The composition of gold was also studied with electron probe microanalyzers (fig. 2).<sup>4</sup> The technology of the manufacture of the majority of the artefacts was also studied.<sup>5</sup>

The material under discussion was found in 6% of all the recorded burials. However, if we take into account the fact that first of all the rich burials had been looted, then these statistics need a significant correction, increasing the percentage of burials with gold items.<sup>6</sup> Of the 78 complexes ca. 25% belong to the Hellenistic period, including 4 of early Hellenistic date and 11 (or more than half of all the Hellenistic burials with gold objects) – belong to the late Hellenistic period. More than a half of all burials with gold items date to the first three centuries of our era (ca. 56%). Among them is a significant predominance of burials dating from the 1<sup>st</sup> – the first half of the 2<sup>nd</sup> century AD, the number of which is more than three times higher than that of the burials with gold objects of the second half of the 2<sup>nd</sup> and the 3<sup>rd</sup> centuries (ca. 13%). A small increase in the number of funeral complexes with gold is attested for the 4<sup>th</sup> and 5<sup>th</sup> centuries AD (ca. 17%, see fig. 1, 3).<sup>7</sup> If we extrapolate from these statistics and assume that burials with gold items of different chronological periods were looted with approximately the same intensity (which, incidentally, is not necessarily so), it cannot be overlooked that the peak of the use of gold items in funerals lies in a relatively narrow period from the late 2<sup>nd</sup>/early 1<sup>st</sup> century BC to the mid-2<sup>nd</sup> century AD. Other data, including anthropological studies, testify that this was the period of the highest prosperity of the city and statistics shows that 70% of all the burials dating from the 1<sup>st</sup> century BC to the 5<sup>th</sup> century BC belong to that period<sup>8</sup>.

In the burials of the second half of the 4<sup>th</sup> to the 2<sup>nd</sup> century BC, the proportion of the funeral gold items specially made for the burial is not high.<sup>9</sup> However, from the 1<sup>st</sup> cen-

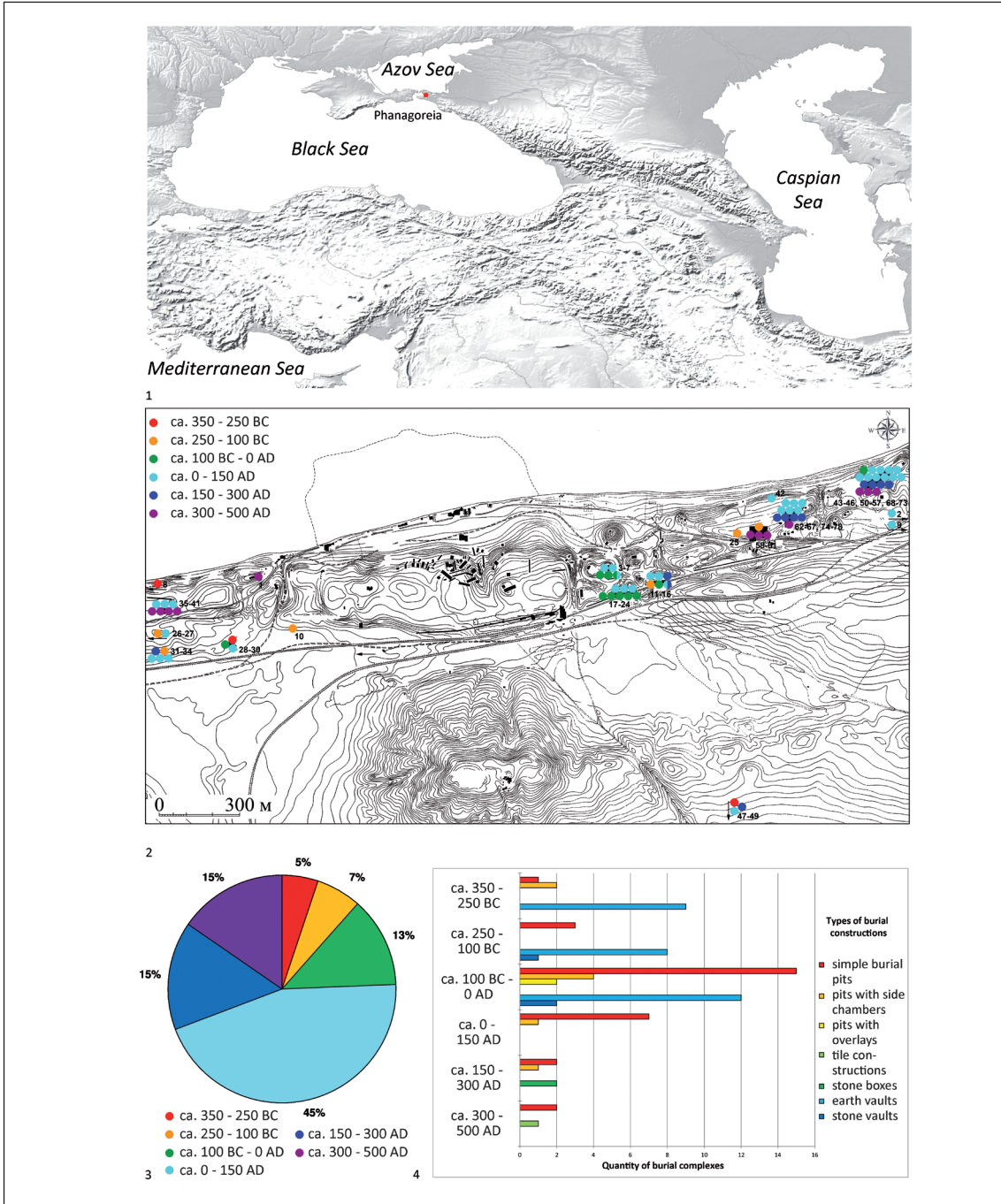


Fig. 1: 1 – map of the Pontic area with the location of Phanagoria; 2 – map of Phanagoria with location of the burials, which yielded the finds of gold objects; 3 – diagram with the chronological distribution of burials in Phanagoria, which yielded the finds of gold objects; 4 – chronological distribution of the types of burials in Phanagoria, which yielded the finds of gold objects.

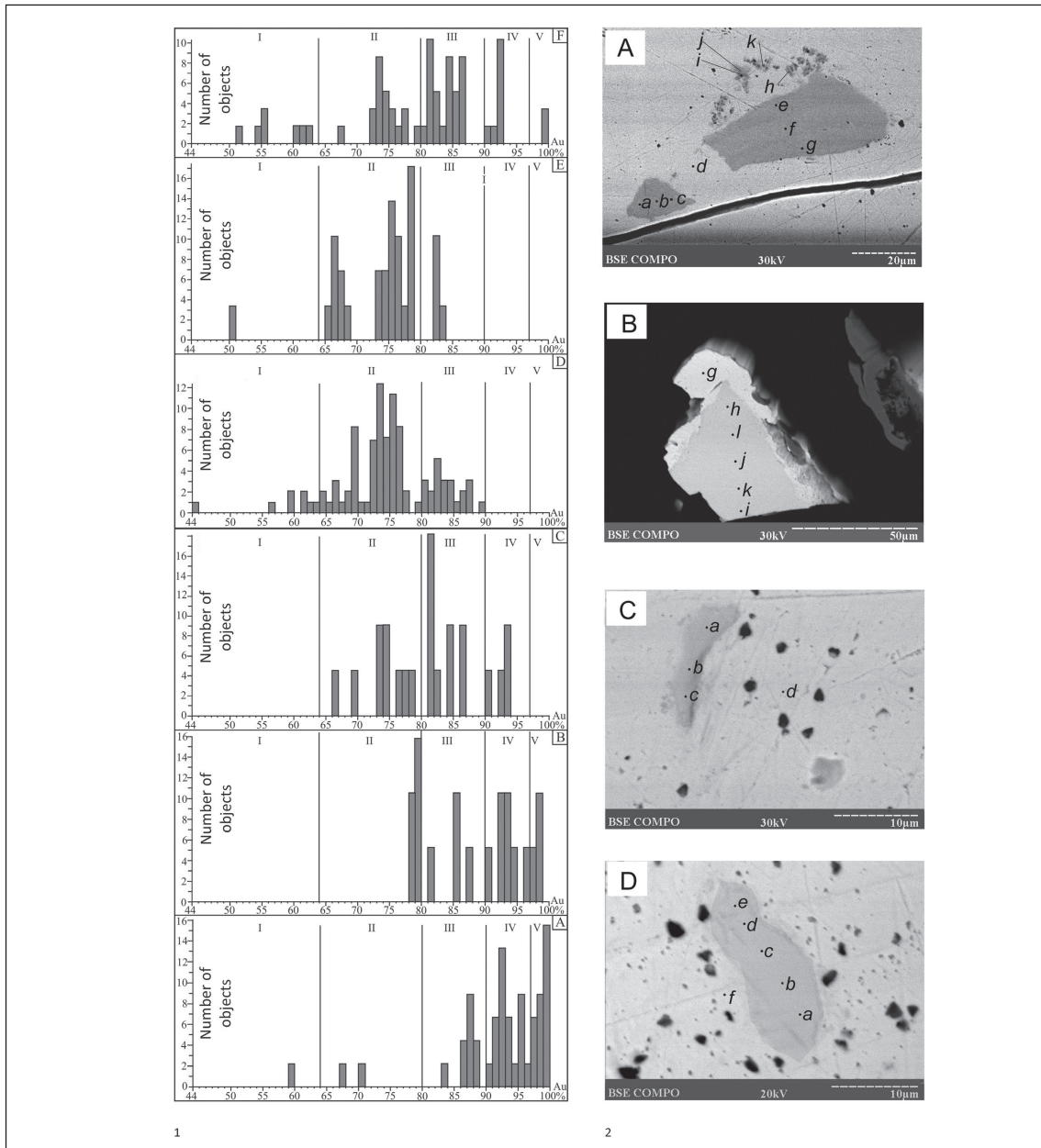


Fig. 2: 1 – Histograms of distribution of gold composition in the finds from Phanagoria. F – 4<sup>th</sup>–5<sup>th</sup> centuries AD, 58 analysis; E – second half of the 2<sup>nd</sup>–3<sup>rd</sup> centuries AD, 29 analysis; D – 1<sup>st</sup>–first half of the 2<sup>nd</sup> century AD, 97 analysis; C – late 2<sup>nd</sup>–1<sup>st</sup> century BC, 22 analysis; B – second half of the 3<sup>rd</sup>–late 2<sup>nd</sup> century BC, 19 analysis; A – second half of the 4<sup>th</sup>–first half of the 3<sup>rd</sup> century BC, 45 analysis. I – electrum; II – low-karat gold; III – medium-karat gold; IV – high-karat gold; V – refined gold. 2 – Micro-inclusions of osmium in the leaves of a golden wreath cat. no. 138 (secondary electron images).





Fig. 3: Southern necropolis: burial mound “Sennoi 231”/2003. Burial no. 5: 1 – necklace cat. no. 139; earring cat. no. 140A; 3–9 – wreath cat. no. 139. Moscow, Institute of Archaeology.



Fig. 4: South-Eastern necropolis: burial no. 15/1978: 1 – necklace or diadem cat. no. 79; 2 – earring cat. no. 80A; 3 – finger ring cat. no. 78. – Western necropolis: burial mound, burial no. 1/1954: 4 – earring cat. no. 33B; 5 – bead cat. no. 35; 6 – finger ring cat. no. 34. Section “Upper town”/1978: 7 – fragmentary necklace terminal cat. no. 85. Moscow, Institute of Archaeology.

ture BC onwards specially fashioned gold items such as wreaths and diadems,<sup>10</sup> ghost money (fig. 8, 6), indications and imitations of coins,<sup>11</sup> elements of burial belts<sup>12</sup> (fig. 8, 1–5), as well as some ornaments that could not be worn in real life, including earrings and even torcs<sup>13</sup> (fig. 7, 1), predominate.

It is worth noting, that practically all the complexes of the late Hellenistic period included finds of funeral diadems in the form of ribbons with hooks at the ends,<sup>14</sup> while the finds of “real jewellery” (earrings, finger rings, all partly melted) of that time originate from the burned layer on the city’s acropolis, probably associated with the destruction of the city in 63 BC (fig. 5).<sup>15</sup> Phanagoria was an important outpost for the Pontic King Mithridates VI on the Asian side of the Bosphorus (App. *Mithr.* 108). The Phanagorians revolted against Mithridates VI. Apparently, the fire was so fierce and dangerous that Artaphernes, the eldest son of Mithridates, surrendered in order to save his younger brothers and sister. The fact that the excavations revealed the ruins of that very building (or palace?) is proven not only by the traces of a huge fire, but also by the find of the epitaph on the marble base for the bronze statue of Hypsikrateia, the wife of Mithridates VI, who probably died during the Phanagorian revolt against Mithridates.<sup>16</sup>

In the 1<sup>st</sup> – first half of the 2<sup>nd</sup> century AD, the richest burials contain gold articles made especially for the burial, but only in minimal amounts. Among the numerous decorations and metal elements of the dress from the burial of a girl of the second half of the 1<sup>st</sup> century AD (figs. 6–7),<sup>17</sup> only the torc (fig. 7, 1) was made especially for the burial; all the other objects, among them appliqués (fig. 7, 4–7), a finger ring (fig. 7, 2), a bracelet (fig. 7, 3) and details of the necklace (fig. 6) belong to “real” jewellery. Usually the intact graves of that time contained much less gold jewellery and only some gold leaves of the funeral wreaths or diadems.<sup>18</sup>

In the second half of the 2<sup>nd</sup>–3<sup>rd</sup> centuries AD, as in the late Hellenistic period, “funeral gold” predominates, however, as a rule, the intact graves also contain finds of separate gold leaves.<sup>19</sup> A rare exception is the vault no. 54/2006 of the Eastern necropolis, in which a faceted ring with a glass inlay was also found.<sup>20</sup>

In late Antiquity, a certain balance is established between the funerary and real ornaments, and together with elements of funeral wreaths and belts, ‘real’ necklaces, earrings, rings, as well as details of garment embroidery are found.<sup>21</sup>

To whom belonged the burials with gold? The observations presented above demonstrate that gold items were one of the markers of the elite burials, at least in the early Hellenistic period, when gold objects were given as grave goods for burials under burial-mounds (fig. 1, 4). It is exactly these burial mounds in which the most valuable objects – both in the material and in the artistic sense – were found, as examples from the Sennoi burial mound no. 231 show.<sup>22</sup> They include a standard set of quality gold beads (fig. 3, 1),<sup>23</sup> earrings with lion heads (fig. 3, 2)<sup>24</sup> as well as a gold wreath with a tube-shaped frame of the type well known in Macedonia and Thrace (fig. 3, 3–9).<sup>25</sup> The destroyed burial in the tile construction under the burial mound of the Western necropolis also contained gold objects (fig. 4, 4–6),<sup>26</sup> including a finger ring with a scaraboid



of late Achaemenid type (fig. 4, 6),<sup>27</sup> together with red-figured vases.<sup>28</sup> However, during the following period, the proportion of burials in simple graves containing gold objects gradually increases, reaching 73% in the late Hellenistic period. Especially interesting is the “splash” of the variety of types of burial structures in which gold objects were found, in the 1<sup>st</sup> and in the first half of the 2<sup>nd</sup> century AD and a stable absolute predominance of gold finds in earth vaults, as in the second half of the 2<sup>nd</sup> and in the 3<sup>rd</sup> centuries (80%), and in the 4<sup>th</sup> – 5<sup>th</sup> centuries (ca. 69%) with a significant reduction in the variations in the types of funerary structures in which gold articles were found (fig. 1, 4).<sup>29</sup>

The fact that the material for almost all periods is mostly “ordinary” is evidenced by the fact that there are no combinations or ‘sets’ of jewellery, defined as several objects made in a single artistic style using the same techniques of manufacture and decoration.<sup>30</sup> Nevertheless, for some periods more or less typical combinations of jewellery items were in use, for instance those of earrings with lion heads and small biconical beads for the early Hellenistic time.<sup>31</sup>

In any study of antique jewellery, an important place is occupied by the attempt to distinguish between the products of local workshops and imports, which is not always easy. The following *criteria* could help in the allocation of local types of jewellery: 1) the uniqueness of the shape, 2) the distribution mainly in the given territory. At the same time, it would be logical to consider items of supposedly non-Bosporan production as imports.<sup>32</sup>

A significant part of them is dated into the early Hellenistic period and comes from three complexes: a cremation in the bronze hydria in the burial mound Sennoi 231<sup>33</sup> (fig. 3), a tiled grave in the burial mound of the Western necropolis (1954) (fig. 4, 4–6)<sup>34</sup> and the burial no. 15/1978 of the South-Western necropolis (fig. 4, 1–3). The second group, which conventionally could be considered imports as they have parallels in the Treasure found on Delos and in the shipwreck of Antikythera, were found in the burnt layer of 63 BC in the acropolis of Phanagoria.<sup>35</sup> Thus, virtually all the gold objects of the Hellenistic period that could be imports come from the contexts associated with the elite of Phanagoria.

However, as mentioned above, the majority of the gold artefacts from Phanagoria are items made of thin foil especially for burial purposes. It is hard to imagine that such products were imported. Of course, there were exceptions, but these are extremely rare. But as the finds of “funeral gold” in Phanagoria are represented by items that have close parallels in other centres of the Bosporan Kingdom (with some rare exceptions), it would be difficult to define them as products of the Phanagorian workshops, rather than more generally the Bosporan workshops.<sup>36</sup>

In this regard, special attention should be paid to two kinds of finds of allegedly North Pontic origin, which are mainly concentrated in the Bosporan territory, like the medallions with Eros and a butterfly (fig. 6, 1),<sup>37</sup> or the finger rings with the inscription XAPA on the bezel<sup>38</sup> (both found in the child burial no. 38/2003 of the Eastern necropolis, see fig. 7, 2), which were found rather often in the burials of children, and those



Fig. 5: Section "Upper town"/1999, Object no. 85: 1-3, 5 – earring pendants, fragments of earrings cat. nos. 123-126; 4, 6 – drops of melted gold cat. nos. 127-128; 7-8 – finger rings cat. nos. 129-130. Moscow, Institute of Archaeology.



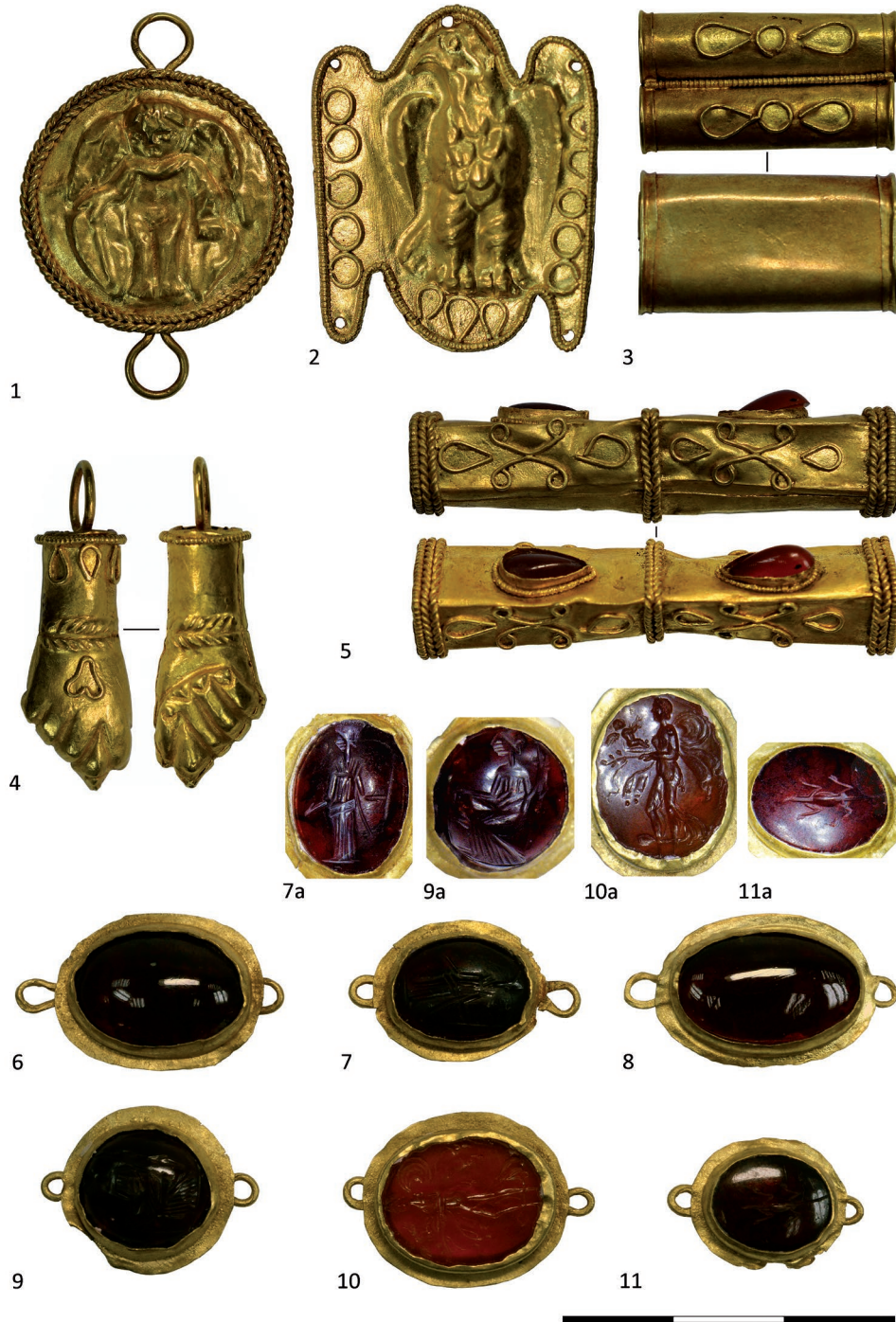


Fig. 6: Eastern necropolis: burial no. 38/2003. 1 – medallion – a sleeve fastener (?) cat. no. 159B; 2 – a pendant reworked in an appliqué cat. no. 143; 3 – double-tube divider cat. no. 148; 4 – fica pendant cat. no. 149; 5 – tube bead cat. no. 147; 6–11 – necklace settings with inlays cat. nos. 150–155. Moscow, Institute of Archaeology.



Fig. 7: Eastern necropolis: burial no. 38/2003. 1 – funeral torc cat. no. 156; 2 – finger ring cat. no. 158; 3 – bracelet cat. no. 157; 4 – appliqué cat. no. 145; 5 – appliqué cat. no. 142; 6 – appliqué cat. no. 144; 7 – appliqué cat. no. 146. Moscow, Institute of Archaeology.





Fig. 8: Western necropolis (“MTF”); vault no. 1/1991. Coffin no. 4. 1-3 – funeral buckles cat. no. 115; 4-5 – funeral belt tips cat. no. 116; 6 – ghost coin cat. no. 117. Moscow, Institute of Archaeology.



items of allegedly Bosphorus manufacture, the finds of which are concentrated mainly in the territory of the Asian part of the state. In the case of necklaces composed of bezels in the form of two triangles with a diamond-shaped central part, the finds of which are known from Phanagoria<sup>39</sup> (fig. 4, 1–1a) and also from from the Tsukur-Liman, as well as the necropolis of Gorgippia, the burial-mound near Maikop in the Kuban basin, as well as the necropolis of Tanais in the estuary of the Don river,<sup>40</sup> there are no convincing reasons to attribute all of them to the products of the Phanagoria workshops – they could have been manufactured also in Gorgippia and Tanais.<sup>41</sup> However the situation is different with the elements of funeral belts from Phanagoria. All of them were found in the burials of the late 4<sup>th</sup>–early 5<sup>th</sup> century AD, and most of the bezels of buckles, appliqués and belt tips imitate inlays in settings. Outside the Asian part of the Bosphoran Kingdom, similar funeral belts of the Late Antique period are unknown. In this case, the concentration of finds in the Asian part of the Kingdom and the absence of such items in the European side of the state are possible arguments in favour of considering them as products of the Phanagorian workshop.<sup>42</sup> It is worth to note that some of them were made by embossing on matrices, whereas as for others, real belt fittings were used as matrices.<sup>43</sup>

In the absence of finds of tools for the manufacture of gold items in Phanagoria, an important role is played by finds of gold ornaments, which could be considered scrap.<sup>44</sup> In my opinion, we can consider the fragment of the necklace terminal with filigree and granulation (fig. 4, 7), which was found in 1978 at the section “Upper Town”<sup>45</sup> and which belongs to the type discussed above, to have been scrap.<sup>46</sup> It is difficult to assume, that a massive fragmentary gold plate was torn by accident and was simply lost. Rather, it was scrap determined for smelting and reuse. If this is the case, we have a proof of jewellery production, which can be dated from the late 4<sup>th</sup> to the 2<sup>nd</sup> century BC, when the necklaces to which the fragmentary terminal could relate, were in use. It is also worth noting that this type of necklaces, as was shown above, was very likely made in the workshops of the Asian part of the Kingdom and in Tanais.<sup>47</sup>

Given the micro-inclusions of osmium in the objects of the Early Hellenistic period (fig. 2, 2a–d),<sup>48</sup> it is likely that placer deposits served as source for their manufacture, whereas the jewellery was usually made of high-karat gold, which was often refined (fig. 2, 1a).<sup>49</sup> It is also possible that high-karat solders could have been used, probably of the same type of metal from which the gold objects were made, sometimes with the addition of some copper.<sup>50</sup> Mercury was detected in the gold of the solder, used for soldering halves of large biconical beads from the cremation in the bronze hydria<sup>51</sup>. Most likely, the joining of the two halves of the beads occurred as a result of the amalgamation of the surface.<sup>52</sup>

During the Hellenistic period, the fineness of the gold gradually decreased and low- and medium-karat alloys were increasingly used (fig. 2, 1b–c). The source of the metal could be widespread gold-quartz and gold-polysulfide-quartz deposits.<sup>53</sup> Gradually, gold items in burials cease to be an unambiguous marker of the elite. Techniques used to

make gold items in the High Hellenistic period did not undergo significant changes in comparison to the previous period.<sup>54</sup> The main quantity of gold items of the late Hellenistic period is represented by funeral diadems, which, judging by the nature of the defects along the edges could be cut out with scissors.<sup>55</sup> For one of the finger rings found in the destruction layer of 63 BC on the Acropolis, the use of a special reflective gold foil in the form of a circle, lining the tray under the inlay is attested (fig. 5, 7).<sup>56</sup> The use of this technique in the ring of the shape typical for the late Hellenistic period, which was widespread in the Mediterranean and in the Black Sea regions,<sup>57</sup> allows us to reconsider the genesis of this method, which until now was associated with the jewellery of the Late Antique period.<sup>58</sup>

During the Hellenistic period, the proportion of the Bosphoran products gradually grows, among which there were also most likely those manufactured directly in Phanagoria – this is proven both by observations on the distribution of finds, and by the fragment of the necklace terminal mentioned above (fig. 4, 7), found in the settlement layer, which may have been scrap collected for smelting.<sup>59</sup>

Characteristic for the 1<sup>st</sup>–3<sup>rd</sup> centuries AD is the predominance of low-karat gold (fig. 2, 1d). Most probably the sources of gold changed in the beginning of the Christian era – it is possible that deposits with low-karat gold were used, such as gold-pyrite-polymetallic deposits of the Trans-Caucasus and Asia Minor.<sup>60</sup> Since the turn of the Christian era, certain changes in technology happened.<sup>61</sup> With rare exceptions, items of jewellery from the 1<sup>st</sup> – first half of the 2<sup>nd</sup> centuries AD were made of a triple alloy with a consistently high silver content (primarily of 20–30%) and stable copper content (up to 3–4%).<sup>62</sup> At this time, there was a surge in the use of gold items in Phanagoria, and the largest variety of types of funerary structures in which gold items were found (fig. 1, 3–4), which indicates a relatively broad social and ethnic base of this phenomenon and a relatively high standard of living in this period. It is worth noting that in the richest burials with gold objects of this time, items of funerary gold are extremely rare.<sup>63</sup>

In the second half of the 2<sup>nd</sup> – 3<sup>rd</sup> centuries AD the total number of burials in which gold articles were found decreases more than thrice in comparison with the previous period, while the variety of types of burial structures is considerably narrowed (fig. 1, 3–4). As in the late Hellenistic period, the “funerary gold” of local work prevails.<sup>64</sup> In Late Antiquity, gold of various compositions, from electrum to refined gold, was in use, while its sources were probably supplemented with copper-zinc-pyrite deposits with the typical gold-bearing zone of oxidation. In this time, gold characterized by a great variability of silver content was primarily used, probably due to the use of scrap jewellery (fig. 2, 1f). On the whole, the period is characterized by an extraordinary variety of metal compositions: from electrum to refined high karat gold and a certain balance established between the funerary and real ornaments.<sup>65</sup>

## Notes

- <sup>1</sup> Kuznecov 2002, 59–68; Kuznetsov 2010, 431–469; Kuznetsov 2013, 12–39.
- <sup>2</sup> Voroshilov – Voroshilova 2015, 29–31 fig. 1.
- <sup>3</sup> The book in Russian has been published: Treister (ed.) 2015.
- <sup>4</sup> Zaikov et al. 2015, 266–310; Saprykina – Pel’gunova 2015, 311–321.
- <sup>5</sup> Saprykina 2015, 208–265.
- <sup>6</sup> Voroshilov – Voroshilova 2015, 76.
- <sup>7</sup> Voroshilov – Voroshilova 2015, 73–75 figs. 16, 17; Treister 2015b, 326.
- <sup>8</sup> Treister 2015b, 329f.
- <sup>9</sup> Abramzon – Treister 2015, 194–199 fig. 1.
- <sup>10</sup> Treister 2015a, 81–103 figs. 3–18.
- <sup>11</sup> Abramzon 2015, 182–193; Abramzon – Treister 2015, 194–201; Abramzon et al. 2016, 7–23; Abramzon et al. 2017, 282–290.
- <sup>12</sup> Treister 2015a, 166–173 fig. 40; Treister 2017, 310–322.
- <sup>13</sup> Treister 2015a, 116 fig. 21, 5; 117–119 fig. 23, 2.
- <sup>14</sup> Treister 2015a, 101 figs. 12, 2–10; 16–18.
- <sup>15</sup> Abramzon – Kuznetsov 2011a, 78, 79 fig. 1; Abramzon – Kuznetsov 2011b, 16, 74 fig. 5; Treister 2013, 12–21; Treister 2015a, 105–107 fig. 19; 148–149 fig. 33, 5, 6; Treister 2015d, 440–444 nos. 123–130, pls. 34, 35.
- <sup>16</sup> Kuznetsov 2007, 238–243 figs. 5–9; Kuznetsov 2010, 448 f. fig. 16; Abramzon – Kuznetsov 2011a, 103 f.; Abramzon – Kuznetsov 2011b, 16, 74 fig. 2.
- <sup>17</sup> Voroshilov – Voroshilova 2015, 56 no. 52; Treister 2015d, 458–477 nos. 142–159 pls. 44–50.
- <sup>18</sup> Treister 2015a, 97 fig. 14, 1; 101–103; Treister 2015b, 327; Mordvintseva et al. 2015, 537–539 nos. 237–241 pl. 76.
- <sup>19</sup> Treister 2015b, 327; Treister 2015d, 492 f. no. 222 pl. 58, 3, 4.
- <sup>20</sup> Voroshilov – Voroshilova 2015, 62 no. 62; Treister 2015a, 153 fig. 34, 10; Treister 2015b, 327; Treister 2015d, 492 f. no. 177 pl. 58, 2.
- <sup>21</sup> Treister 2015a, 84–89 figs. 5–7; 116 fig. 21, 20, 21; 153 fig. 34, 12; 157 f. fig. 36; 166–173 fig. 40; Treister 2015b, 327.
- <sup>22</sup> Kuznetsov 2010, 452 fig. 30; Voroshilov – Voroshilova 2015, 54 no. 48; Treister 2015b, 328; Treister 2015d, 450–458 nos. 137–142 pls. 38–42.
- <sup>23</sup> Treister 2015a, 119–122, fig. 24, 1; Treister 2015d, 453, 456 no. 139 pl. 42, 1–3.
- <sup>24</sup> Treister 2015a, 108–111, fig. 20, 2; Treister 2015d, 456–458 no. 140 pl. 42, 4, 5.
- <sup>25</sup> Treister 2015a, 77–80, fig. 1; Treister 2015d, 450–453 no. 138, pls. 39–41.
- <sup>26</sup> Marchenko 1960, 22–28; Nikulina 1965, 192–195; Pfrommer 1990, 285, FK 159; Treister – Tugusheva 2014, 393–405 figs. 1, 2; Voroshilov – Voroshilova 2015, 35 no. 8; Treister 2015c, 367–371 nos. 32–35 pl. 11.
- <sup>27</sup> Marchenko 1960, 25–28; Nikulina 1965, 186 fig. 1, 11; 192–195; Treister 2015c, 368 f. no. 34 with complete bibliography pl. 11, 3–5.
- <sup>28</sup> CVA Pushkin Museum 6, p. 34, pls. 22; 28; Treister – Tugusheva 2014, 399 f. fig. 2.
- <sup>29</sup> Voroshilov – Voroshilova 2015, 73–75 fig. 17; Treister 2015b, 328.
- <sup>30</sup> Cf. Treister 2016, 50–56.



- <sup>31</sup> Treister – Tugusheva 2014, 393–405.
- <sup>32</sup> Treister 2015b, 330f.
- <sup>33</sup> See above note 22.
- <sup>34</sup> See above note 26.
- <sup>35</sup> Voroshilov – Voroshilova 2015, 41 no. 20; Shavyrina 1983, 71–73; Treister 2015d, 404–409 nos. 78–83. See on the parallels to the earrings and finger rings: Treister 2013, 13–14; Treister 2015a, 105–107. 148f.
- <sup>36</sup> Treister 2015b, 331f.
- <sup>37</sup> Treister 2015a, 142f. fig. 32, 3; Treister 2015d, 476f. no. 159, pl. 50. See about the medallions of this type and their distribution: Treister 2007, 92 map 34.
- <sup>38</sup> Treister 2015a, 154f. fig. 34, 2; Treister 2015d, 474f. no. 158, pl. 49, 3. 4.
- <sup>39</sup> Treister 2015a, 124–126 fig. 26, 1; Treister 2015d, 404–406 no. 79 pl. 22, 3–6. See about the necklaces of this type and their distribution: Pfrommer 1990, 264 note 2280; Treister 2007, 61 map 19.
- <sup>40</sup> Treister 2007, 61 map 19.
- <sup>41</sup> Treister 2015b, 332.
- <sup>42</sup> Treister 2015a, 166–173 fig. 40; Treister 2015b, 332; Treister 2017, 310–322.
- <sup>43</sup> Saprykina 2015, 252f.
- <sup>44</sup> Treister 2015b, 333f.
- <sup>45</sup> Treister 2015a, 125 fig. 26, 2; 126; Treister 2015d, 410f. no. 85 pl. 24, 4.
- <sup>46</sup> See above note 44.
- <sup>47</sup> See above note 41.
- <sup>48</sup> Zaikov et al. 2015, 278f. fig. 3A.
- <sup>49</sup> Zaikov et al. 2015, 285–289.
- <sup>50</sup> Saprykina – Pel’gunova 2015, 312–315.
- <sup>51</sup> Treister 2015a, 119–122, fig. 24, 1a; Treister 2015d, 453. 456 no. 139 pl. 42, 1. 2.
- <sup>52</sup> Saprykina – Pel’gunova 2015, 313.
- <sup>53</sup> Zaikov et al. 2015, 278f. fig. 3B–C.
- <sup>54</sup> Saprykina 2015, 259–261.
- <sup>55</sup> Treister 2015a, 101 figs. 12, 2–10; 16–18; Saprykina 2015, 261.
- <sup>56</sup> Treister 2015a, 148f. fig. 33, 5; Treister 2015d, 443 no. 129, pl. 35, 1. 4.
- <sup>57</sup> Treister 2015a, 148f.
- <sup>58</sup> Adams 2006, 12; cf. Saprykina 2015, 244, 261.
- <sup>59</sup> Treister 2015b, 335f.
- <sup>60</sup> Zaikov et al. 2015, 278f. fig. 3D.
- <sup>61</sup> Saprykina 2015, 261–263.
- <sup>62</sup> Saprykina 2015, 262f.; Zaikov et al. 2015, 270–272 table 2.
- <sup>63</sup> Voroshilov – Voroshilova 2015, 73–75 figs. 16. 17; Treister 2015b, 336.
- <sup>64</sup> Voroshilov – Voroshilova 2015, 73–75 figs. 16. 17; Treister 2015b, 337.
- <sup>65</sup> Zaikov et al. 2015, 278f. fig. 3F.

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Fig. 1: 1 – M. Treister, 2018; 2 – after Voroshilov – Voroshilova 2015, 30 fig. 1; 3 – after Voroshilov – Voroshilova 2015, 31 fig. 2; 4 – after Voroshilov – Voroshilova 2015, 75 fig. 17. – Fig. 2: 1 – after Zaikov et al. 2015, 279 fig. 3; 2 – after Zaikov et al. 2015, 286 fig. 7. – Fig. 3. Photo: M. Treister (2013). – Fig. 4. Photo: M. Treister (2013). – Fig. 5. Photo: M. Treister (2012). – Fig. 6. Photo: M. Treister (2013). – Fig. 7. Photo: M. Treister (2013). – Fig. 8. Photo: M. Treister (2013).

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