

# COMPOSITIONAL ANALYSES OF SOME GOLDEN HORDE PERIOD COPPER COINS

This work presents the results of the investigation by X-Ray Fluorescence (XRF) technique of some copper coins minted in the Eastern Medieval Moldavia – Bessarabia, namely the so-called Costești-Gârla and Şehr al-cedid<sup>1</sup> issues (nos. 6-11 in the catalogue). These coins were issued before the end of the Golden Horde domination in 1369, during the civil war times (the period of “the Rival Families”). For comparison, some other Tatar (nos. 1-5) and Moldavian (nos. 12-13) copper coins were also analyzed.

The Costești-Gârla issues were named after the Gârla Sector of the archaeological settlement of Costești (South of Chişinău), where such coins were discovered for the first time and from which most of the known exemplars come<sup>2</sup>. They were probably minted in the oriental towns of Costești or Cetatea Albă - Akkerman (nowadays Belgorod-Dnestrovsk, in Ukraine), right after the middle of the 14<sup>th</sup> century (most likely c. 1359-1363)<sup>3</sup>. The coins are characterized by pseudo-Arabic inscriptions. However, the prototypes for these coins were not yet identified. Most of the known pieces belong to the category named Costești-Gârla I, bearing a peculiar dynastic symbol – *tamga* – on the obverse; they are made of superposed sheets of copper. Their average weight is 0.80 g. The other category of coins, Costești-Gârla II, bears only pseudo-inscriptions; they are heavier (1,57 g average weight), the flans being made by employing the usual technique, i.e. from copper bars. Two pieces (nos. 6-9) from each group were analyzed by X-Ray Fluorescence technique.

The obverse Arabic inscription of the Şehr al-cedid copper issues is obscure; that of the reverse indicate that they were minted in “the New Town the well guarded” (*Şehr al-cedid al-mahrusa*), without the hegira year<sup>4</sup>. They were dated

<sup>1</sup>We prefer to use here the simplest transliteration of the Arabic inscriptions, based upon the modern Turkish alphabet.

<sup>2</sup>For the discoveries from Costești, see Polevoj 1969. A general typology was presented by Nicolae, 2005b. See also Травкин 1994, 37 and Травкин 2006.

<sup>3</sup>This is the chronology proposed by L.L. Polevoj and E. Nicolae. S.N. Travkin considers that these coins were minted after 1369. See the previous note.

<sup>4</sup>For the “New Town” coinage see especially Янина 1977; Nicolae 1997; Nicolae 2002, 147-148 (= Nicolae 1999, 142-144); Nicolae 2003; Nicolae 2005a; Nicolae 2007b.

c. 1365-1367 by comparison with the silver issues of the same mint bearing the hegira years. The “New Town” was located in Orheiul Vechi (Trebujeni, Orhei district, Republic of Moldavia), where the remains of an important oriental city were excavated and from which most of the known pieces come. The mint worked between 764 and 770 hegira years (1362/1363-1368/1369 A.D.) and the inscriptions of the first silver issues include the name of Khan Abdallah (1362-1369); the late silver issues, as well as the copper ones, are anonymous and they are considered to be a local coinage<sup>5</sup>. Some of the copper coins are overstrike “rose type” issues from the time of Canibek Khan. However, the two pieces which were analyzed by XRF are not overstrikes (nos. 10-11).

For comparison, two pieces of the most common Tatar copper coins attested by local discoveries, i.e. the anonymous “rose type” issues of Canibek epoch (1350-1357 A.D.) or later, minted in Saray al-cedid, on the Volga (nos. 1-2) were analyzed. Because some of the coins belonging to that category, found in different cities of the Golden Horde are clearly imitations of unknown mints (Травкин 1994, 37; Клоков, Лебедев 1999; Клоков, Лебедев 2000; Травкин 2000, 188-189; Клоков, Лебедев 2002; Nicolae, Costin 2003, 183; Nicolae 2005a, 1367, 1371, fig. 2/1-4; Лебедев, Павленко, Бугачев 2005, 131-141; Лебедев, Смирнов 2005, 24-30), three such coins discovered in Bessarabia were also analyzed (nos. 3-5). Two of them are characterized by the barbarized reverse Arabic inscriptions (nos. 3 and 5). The reverse inscription (mostly obliterated) of the other one seems to be of good style, but the rose shape is peculiar (with full inner petals, like the imitation no. 3)<sup>6</sup> and the metal aspect is different from that of the original “rose type” coins. However, coins with similar roses and good style inscriptions are considered official issues by Lebedev and his collaborators<sup>7</sup>, which generally accept as imitations only the coins with barbarized inscriptions<sup>8</sup>. The analyses will permit to check this point of view.

Two Moldavian half-groschen of Alexander I (1400-1432) were analyzed as well (nos. 12-13); these issues replaced definitively the Golden Horde copper coinage on the local market (Nicolae 2005c, 126; Nicolae 2007a, 305).

<sup>5</sup> On the early silver coins, the name of the mint place is in Turkish version: Yangi-şehr. The late silver coins and the copper ones present only the Arabic version: Şehr al-cedid.

<sup>6</sup> A drawing of an imitation with barbarized inscription and a rose with full inner petals with point in the centre (as on the coin no. 3 in our catalogue), discovered in Azak, was published by Lebedev, Smirnov 2005, 28, fig. 4/6. Some similar imitations were found in Selitrennoe (Клоков, Лебедев 2002, 129, fig. 21/e and ž) and in Bel'džamen (Клоков, Лебедев 2000, 132, fig. 10/7-8).

<sup>7</sup> See the drawings of roses with full inner petals without point in the centre, from Kırım and Azak (Лебедев, Смирнов 2005, 27, fig. 3/a-1), and with point in the centre, from Масар (Лебедев, Павленко, Бугачев 2005, 136, fig. 4/13-1). Some pieces with similar roses were found in Selitrennoe (Клоков, Лебедев 2002, 128, fig. 20/12-13) and in Bel'džamen (Клоков, Лебедев 2000, 130, fig. 8/30 e, and 131, fig. 9/ 52).

<sup>8</sup> Based on statistical analyses of the variants of the “rose type” coins of good style discovered in different cities of the Golden Horde, V.P. Lebedev and his collaborators concluded that the official issues were minted not only in the city indicated in the inscription (Saray al-cedid), but also in other centers. This conclusion is not very convincing since the authors did not try to explain the reasons of that unusual phenomenon (possible changes of the rules of copper coins minting and distribution in Canibek epoch or later), neither why it is not possible to have imitations of good style, and did not propose a clear typology. See above note 7 (the works of V.P. Lebedev and his collaborators).

The compositional analysis of the coins was performed by X-Ray Fluorescence (XRF) technique at “Horia Hulubei” National Institute of Nuclear Physics and Engineering, Bucharest. The employed spectrometer consists of a  $^{241}\text{Am}$  annular source (30 mCi), a horizontal HPGe detector (energy resolution: 200 eV at 5.9 keV) and a conventional electronic chain – a preamplifier, spectroscopic amplifier and a MultiChannel Analyser (MCA) card in a personal computer (Constantinescu, Săşianu, Bugoi 2003). The calibration of the set-up was performed by using pure metallic foils (Cu, Ag). The XRF measurements are non-destructive and accurate for the first 100  $\mu\text{m}$  – in depth – of the coins surface. The uncertainties were of the order of 5% for the major elements.

The XRF analyses indicate that the original “rose type” coins (nos. 1-2) are made of a copper-bronze alloy: copper 99,5%; tin 0,10-0,15%; traces of silver and lead. The alloy of one of the imitations (no. 5) is similar. In this case, only the barbarized inscription indicates an imitation. It seems that the workshop which produced this imitation used the same source of metal as the official mints or remelted ancient coins. The workshop is likely to be located in the central parts of the Golden Horde. The presence of tin and lead could be explained by the bronze remnants in the commonly used crucibles to prepare the ingots.

The other two imitations (nos. 3-4) are made of bronze: copper 93-94%; tin 5-6%; traces of lead and antimony; there are also traces of arsenic (no. 3) and silver (no. 4). The presence of antimony could indicate the use of copper of Transylvanian origin. It is obvious that there was no concern to obtain a malleable alloy. However, it is well-known that in the Islamic mints the use of bronze was usually avoided. The need to clearly reproduce the Arabic inscriptions, which are drawn in very low relief, and which are being composed by very thin lines and dots, imposed the use of an alloy adequately malleable; even the dies preparation was problematic (Balogh 1964, 54-55). The composition of the imitations alloy and the barbarized aspect of the first piece inscription suggest masters without experience in minting Islamic coins and no connection with an official mint. These bronze imitations could have been produced in workshops located in a marginal region of the Golden Horde, eventually in Bessarabia or Crimea. So, our investigation confirms the idea that “rose type” imitations (inclusively issues of good style) were produced in many workshops situated in different regions of the space dominated by the Golden Horde. At the present, it is almost impossible to locate the workshops and to identify the imitations of good style, but further compositional analyses could provide some hints in this respect.

The composition of the Costeşti-Gârla coins (nos. 6-9) is similar to that of the original “rose type” coins: high content of copper (99-99,5%) and traces of lead and silver. They differ from the originals by the presence of antimony traces, which suggests the use of copper from other sources than those of the central official mints, maybe of Transylvanian origin, giving support to the idea that they are local issues. Also, the classification in two groups based on typology, style and the average weight, is confirmed by the compositional differences: the traces of tin

(also found in the original “rose type” coins) were observed only for the Costești-Gârla I issues (0,20-0,25%). It seems that these coins represent a local emergency coinage. The alloy is malleable enough to obtain fine inscriptions, but this does not appear to be a deliberate choice, since the style is very poor. The pieces of the first group were made of very thin superposed sheets of copper, probably initially prepared to produce other items. The archaeological research at Orheiul Vechi and Costești revealed the presence – during the investigated period – of workshops producing or repairing metallic tools, vessels, jewels and applied ornaments; copper, bronze, silver, tin, lead and gold were used. The remains of such a workshop were excavated at Orheiul Vechi, nearby the stone commercial edifice (*bazaar*) (Bârnea 1977; Bârnea, Reaboi, Nicolae, Telnov 2001). It seems that such workshops were involved in minting the local coinage.

The copper content of the Şehr al-cedid coins (nos. 10-11) is nearly the same (99%) with that of the original “rose type” coins; the traces of lead, silver and tin seem to be slightly higher. The relatively high content of tin of one piece (0,40%; no. 11) suggests an intentional alloy copper-bronze. They are also characterized by the traces of antimony indicating the use of copper of Transylvanian origin, but the re-melting of ancient Tatar coins to produce these coins can be also considered. Anyway, the results of the XRF analyses, together with the fact that a part of the Şehr al-cedid issues are overstrike “rose type” coins, the very poor style of most of the pieces and the concentration of the discoveries in Eastern Moldavia, confirm the idea that they represent a local coinage.

The Moldavian copper coins of Alexander I (nos. 12-13) are made of copper (99-99,5%) with traces of lead, silver and antimony. They differ from the “rose type” coins by the absence of tin, fact that could indicate the use of specialized crucibles. The presence of antimony, which also characterizes two imitations (nos. 3-4) and the local issues of Costești-Gârla and Şehr al-cedid type, could indicate the Transylvanian origin of the copper. These coins have been struck in Suceava mint, located in North-Western Moldavia, a region where the discoveries of Golden Horde copper issues are very scarce. The use of re-melted ancient Tatar coins seems to be unlikely, and the XRF analyses are not conclusive in this respect.

## CATALOGUE OF THE ANALYZED COINS<sup>9</sup>

### GOLDEN HORDE

Canibek (1341-1357 A.D.) and successors

Obv. Rose ornament; inner petals generated by linear stroke.

Rev. Arabic inscription: “Struck in Saray / al-cedid / 753”.

Cf. Янина 1970, 31 в (for the rose shape).

1. AE 1,57 g; 16 mm. Cu 99,50%; Pb traces; Ag 0,05%; Sn 0,10%.

<sup>9</sup> All coins belong to private collections and were discovered in Orheiul Vechi (nos. 1 and 10) and Costești (nos. 2-9 and 11-13).

Obv. Similar to no. 1.

Rev. Arabic inscription: "Struck in Saray / al-cedid / [7. .]".

Cf. Янина 1970, 31 в (for the rose shape).

2. AE 1,46 g; 16,4 mm. Cu 99,50%; Pb traces; Ag 0,05%; Sn 0,15%.

*„Rose type” imitations*

Obv. Rose ornament: full inner petals with point in the centre.

Rev. Barbarized Arabic inscription: "Struck in Saray / al-cedid / [ . . ]".

Cf. Лебедев, Смирнов 2005, 28, fig. 4/6 (for the rose shape).

3. AE 2,12 g; 18,8×16,3 mm. Cu 93,00%; Pb 0,12%; Sn 6,00%; Sb 0,12%; As 0,10%.

Obv. Rose ornament: full inner petals without point in the centre.

Rev. Arabic inscription: "Struck in [ . . ] / al-cedid / [ . . ]".

Cf. Лебедев, Смирнов 2005, 27, fig. 3/a-1 (for the rose shape).

4. AE 1,82 g; 16,5 mm. Cu 94,00%; Pb 0,10%; Ag 0,05%; Sn 5,00%; Sb 0,10%.

Obv. Rose ornament; inner petals generated by linear stroke.

Rev. Barbarized Arabic inscription. Prototype: "Struck in Saray / al-cedid / [ . . ]".

Cf. Янина 1970, no. 31 в (for the rose shape).

5. AE 0,80 g; 18,5×15,6 mm. Cu 99,50%; Pb traces; Ag 0,05%; Sn 0,10%.

*Costești-Gârla I type*

Obv. Tamga with three branches (as a triskeles); the vertical branch is straight, the extremity of the left one is turned to the left, and the right one is bend to the left; below, barbarized Arabic inscription.

Rev. Barbarized Arabic inscription.

Cf. Nicolae 2005b, 94-97, I, Ba series, no. 14.

6. AE ↖ 1,05 g; 17×14,7 mm. Cu 99,50%; Pb traces; Ag 0,10%; Sn 0,20%; Sb traces.

7. AE ↑ 0,82 g; 15×13,5 mm. Cu 99,00%; Pb traces; Ag 0,15%; Sn 0,25%; Sb 0,40%.

*Costești-Gârla II type*

Obv. Barbarized Arabic inscription.

Rev. Barbarized Arabic inscription.

Nicolae 2005b, 95 (fig. 2), 99 (pl. III) and 100, II, no. 40.

8. AE ↗ 1,90 g; 19,7×17 mm. Cu 99,50%; Pb traces; Ag 0,10%; Sb 0,15%.

9. AE ↓ 0,97 g; 19×16,5 mm. Cu 99,00%; Pb traces; Ag 0,15%; Sb 0,25%.

*Şehr al-cedid type*

Obv. Obscure Arabic inscription.

Rev. Arabic inscription: "Struck in Şehr al-cedid".

Janina 1977, 205-206 and pl. 15; Nicolae 2003.

10. AE → 2,05 g; 15,5 mm. Cu 99,00%; Pb 0,12%; Ag 0,15%; Sn 0,40%; Sb traces.

11. AE ↙ 1,87 g; 15 mm. Cu 99,00%; Pb 0,20%; Ag 0,10%; Sn 0,10%; Sb traces.

## MOLDAVIA

### *Alexander I (1400-1432)*

Obv. Aurochs head between a rose and a crescent, having a star between the horns.

Rev. Parted shield, in first barry of six, in second seven lilies.

Buzdugan, Luchian, Oprescu 1977, 62-63, half-groschen, V type.

12. AE ♂ 0,95 g; 15,2×13,5 mm. Cu 99,50%; Pb 0,10%; Ag 0,15%; Sb traces.

13. AE ♀ 0,45 g; 14,8×12,5 mm. Cu 99,00%; Pb 0,25%; Ag 0,10%; Sb traces.

### Bibliography

Balogh, P. 1964, *The coinage of the Mamelük sultans of Egypt and Syria*, New York  
Bârnea, P., Reaboi, T., Nicolae, E., Telnov, N. 2001, *Materiale arheologice relative la economia monetară din epoca Hoardei de Aur descoperite la Orheiul Vechi*. In: Simpozion de Numismatică, Chişinău, 28-30 mai 2000, Comunicări, studii şi note, Bucharest, 141-149.

Buzdugan, G., Luchian, O., Oprescu, C.C. 1977, *Monede şi bancnote româneşti*, Bucharest.

Constantinescu, B., Săşianu, Al., Bugoi, R. 2003, *Adulterations in First Century B.C.: the Case of Greek Silver Drachmae Analysed by X-Ray Methods*, Spectrochimica Acta, part B: Atomic Spectroscopy, special ICXOM volume no. 58/4, 755-761.

Nicolae, E. 1997, *Quelques considérations sur les monnaies tatares de la «Ville Neuve»*, Studii şi Cercetări de Numismatică 11 (1995), 197-200.

Nicolae, E. 2002, *Două monede din perioada de sfârşit a dominaţiei Hoardei de Aur la vest de Nistru*. In: Simpozion de Numismatică, Chişinău, 13-15 mai 2001, Comunicări, studii şi note, Bucharest, 145-150.

Nicolae, E. 2003, *Monedele de cupru bătute în Oraşul Nou (Şehr al-cedid)*. In: Simpozion de Numismatică, Chişinău, 24-26 septembrie 2002, Comunicări, studii şi note, Bucharest, 167-179.

Nicolae, E. 2005a, *Le monnayage en Bessarabie dans la deuxième moitié du XIV<sup>e</sup> siècle*. In: (Eds. C. Alfaro, C. Marcos, P. Otero) XIII Congreso Internacional de Numismática, Madrid-2003, Actas - Proceedings - Actes, I, Madrid, 1367-1373.

Nicolae, E. 2005b, *Monedele de tip Costeşti-Gârla*. In: Simpozion de Numismatică, Chişinău, 26-28 noiembrie 2003, Comunicări, studii şi note, Bucharest, 89-104.

Nicolae, E. 2005c, *Invazia asprilor otomani şi riposta lui Ştefan cel Mare: emisiunile moldoveneşti de tip otoman*, Acta Moldaviae Septentrionalis 4, 124-131.

Nicolae, E. 2007a, *La pénétration des aspres ottomans dans les Pays Roumains aux XIV<sup>e</sup>-XVI<sup>e</sup> siècles*, Bulletin du Cercle d'Études Numismatiques 1, 44, 302-308.

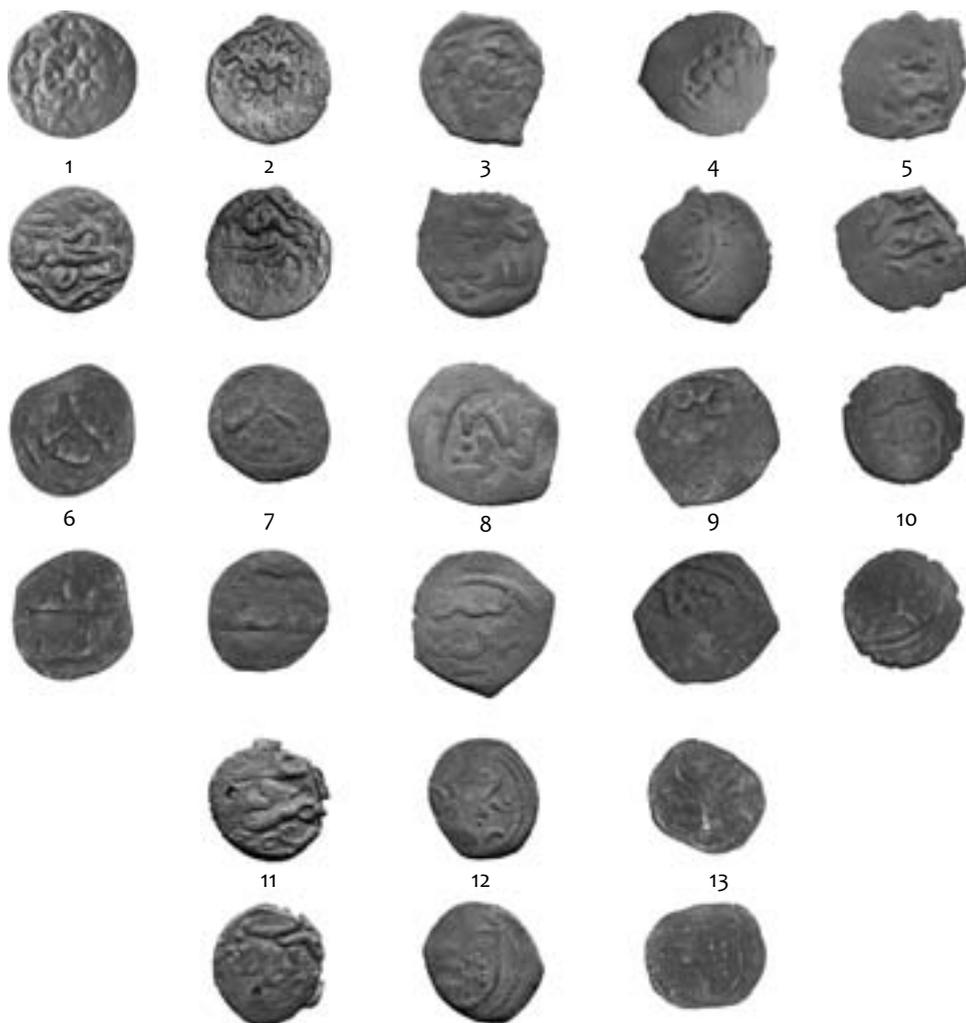
Nicolae, E. 2007b, *Monedele tătareşti din tezaurul de la Săseni, raionul Călăraşi, Republica Moldova*. In: Simpozion de Numismatică, Chişinău, 29 septembrie-2 octombrie 2004, Comunicări, studii şi note, Bucharest, 183-210

Nicolae, E., Costin, B. 2003, *Monede din secolele XIII-XIV descoperite în Dobrogea*, Buletinul Societăţii Numismatice Române 92-97 (1998-2003), 175-187.

Бырня, П.П. 1977, *Ювелирная мастерская XIV в. из Старого Орхья*. В сб.: АИМ (1973 г.), 229-241.

Клоков, В.Б., Лебедев, В.П. 1999, *Загадки новосарайского чекана медных монет в Золотой Орде*. В сб.: Седьмая Всероссийская Нумизматическая Конференция, Ярославль, 19-23 апреля 1999 г. (тезисы докладов), Москва, 64-66.

Клоков, В.Б., Лебедев, В.П. 2000, *Монетное обращение золотоордынского города Бельджамен*. В сб.: Древности Поволжья и других регионов, III, Нумизматический сборник, II, Нижний Новгород, 57-147.



Клоков, В.Б., Лебедев, В.П. 2002, *Монетный комплекс с Селитренного городища (Золотая Орда, г. Сарай)*. В сб.: Древности Поволжья и других регионов, IV, Нумизматический сборник, III, Нижний Новгород, 73-165.

Лебедев, В.П., Павленко, В.М., Бугачев, А.И. 2005, *Комплекс медных монет с Маджарского городища*. В сб.: Труды международных нумизматических конференций. Монеты и денежное обращение в монгольских государствах XIII-XV веков, I МНК - Саратов 2001, II МНК Муром-2003, 131-141.

Лебедев, В.П., Смирнов, В.В. 2005, *Новосарайские пулы с цветочной розеткой из Крыма и Азова*. В сб.: Труды международных нумизматических конференций. Монеты и денежное обращение в монгольских государствах XIII-XV веков, III МНК - Старый Крым, 3-9 октября 2004, Москва, 24-30.

Николае, Е. 1999, *Две монеты финальной стадии золотоордынского господства к западу от Днестра*, *Stratum plus* 6, 142-146.

Полевой, Л.Л. 1969, *Монеты из раскопок и сборов на поселении Костешть-Гырла (1946-1959 гг.)*. В сб.: *Далекое прошлое Молдавии*, Кишинев, 146-161.

Травкин, С.Н. 1994, *О чеканке монет на территории Бессарабии в XIV-XV вв.* В сб.: *Всероссийская Нумизматическая Конференция, 6-8.IV.1994 (тезисы докладов)*, Санкт Петербург, 37-38.

Травкин, С.Н. 2000, *Некоторые вопросы нумизматики и истории Старого Орхя (Золотоордынский период)*, *Stratum plus* 6, 189-195.

Янина, С.А. 1970, *Монеты Золотой Орды из Поволжской Археологической Экспедиции на Царевском городище в 1959-1962 гг.* В сб.: *Поволжье в средние века*, МИА 164, Москва, 194-222.

Янина, С.А. 1977, „*Новый город*” (=Янги-шехр = Шехр ал-джедид) – монетный двор Золотой Орды и его местоположение, *Нумизматический Сборник V/1*, Москва, 193-212 с илл. 15-16.

### **Analize compoziționale ale unor monede de cupru din epoca Hoardei de Aur**

#### *Rezumat*

Autorii prezintă rezultatele analizelor compoziționale ale unor monede de cupru bătute în Basarabia în epoca Hoardei de Aur (sec. XIV). Au fost analizate, prin metoda fluorescenței de raze X, 4 piese de tip Costești-Gârla și 2 piese de tip Șehr al-cedid, iar pentru comparație 5 piese tătărești de tip rozetă (2 originale, bătute la Saray al-cedid, și 3 imitații) și 2 piese moldovenești de jumătate de gros de la Alexandru cel Bun. Monedele locale (Costești-Gârla, Șehr al-cedid și moldovenești) diferă de originalele de tip rozetă prin prezența stibiului, indicând o altă sursă de metal, probabil din Transilvania. Două dintre imitațiile de tip rozetă sunt din bronz (Cu 93-94%; Sn 5-6%), de asemenea cu urme de stibiu, ceea ce dovedește că asemenea piese, inclusiv cele de stil bun, au fost realizate în afara atelierelor oficiale și probabil în zone periferice ale Hoardei de Aur, cum ar fi Crimeea sau Basarabia. Cealaltă imitație are o compoziție similară cu originalele, deci ar proveni dintr-un atelier care utiliza aceeași sursă de materie primă, situat probabil în zona centrală a hanatului.

*Dr. Eugen Nicolae*, “Vasile Pârvan” Romanian Academy Institute of Archaeology, 11 Henri Coandă Str., Sector 1, Bucharest, Romania, e-mail: eugenicolae@yahoo.com

*Roxana Bugoi, Bogdan Constantinescu*, “Horia Hulubei” National Institute of Nuclear Physics and Engineering, 407 Atomistilor Str., Bucharest-Magurele, Romania