

SONDERDRUCK AUS:

**RGZM – TAGUNGEN**

Band 17

Bendeguz Tobias (Hrsg.)

**DIE ARCHÄOLOGIE DER FRÜHEN UNGARN**

**CHRONOLOGIE, TECHNOLOGIE UND METHODIK**

Internationaler Workshop des Archäologischen Instituts  
der Ungarischen Akademie der Wissenschaften  
und des Römisch-Germanischen Zentralmuseums Mainz  
in Budapest am 4. und 5. Dezember 2009

Redaktion: Evelyn Garvey (New York);  
Reinhard Köster, Bendeguz Tobias (RGZM)  
Satz: Hans Jung (RGZM)  
Umschlaggestaltung: Reinhard Köster (RGZM)

### **Bibliografische Information der Deutschen Nationalbibliothek**

Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über <http://dnb.d-nb.de> abrufbar.

**ISBN 978-3-88467-205-1**

**ISSN 1862-4812**

© 2012 Verlag des Römisch-Germanischen Zentralmuseums

Das Werk ist urheberrechtlich geschützt. Die dadurch begründeten Rechte, insbesondere die der Übersetzung, des Nachdrucks, der Entnahme von Abbildungen, der Funk- und Fernsehsendung, der Wiedergabe auf photomechanischem (Photokopie, Mikrokopie) oder ähnlichem Wege und der Speicherung in Datenverarbeitungsanlagen, Ton- und Bildträgern bleiben, auch bei nur auszugsweiser Verwertung, vorbehalten. Die Vergütungsansprüche des § 54, Abs. 2, UrhG. werden durch die Verwertungsgesellschaft Wort wahrgenommen.

Herstellung: Strauss GmbH, Mörlenbach  
Printed in Germany.

# INHALT

*Falko Daim*

Vorwort ..... IX

## **Vor der Landnahme**

*Attila Türk*

Zu den osteuropäischen und byzantinischen Beziehungen der Funde des 10.-11. Jahrhunderts  
im Karpatenbecken ..... 3

*Charlotte Hedenstierna-Jonson*

Traces of contacts: Magyar material culture in the Swedish Viking Age context of Birka ..... 29

## **Chronologische Fragen zum Fundmaterial des Karpatenbeckens**

*Péter Langó*

Notes on the dating of Byzantine coin finds from 10<sup>th</sup> century context in the Carpathian Basin ..... 49

*Péter Prohászka*

Bemerkungen zum byzantinischen Münzverkehr der ungarischen Landnahmezeit  
und der Staatsgründung im Karpatenbecken ..... 67

*Gabriel Fusek*

Chronologische Fragen der Nitraer Gräberfelder des 10.-11. Jahrhunderts:  
das Fallbeispiel Nitra-Šindolka ..... 89

*Gabriel Nevizánsky · Jiří Košta*

Die Ausgrabung eines frühungarischen Reitergräberfeldes in Streda nad Bodrogom (okr. Trebišov/SK)  
in den Jahren 1926 und 1937 ..... 113

*Miklós Takács*

Die Chronologie der Siedlungen und besonders der Siedlungskeramik des Karpatenbeckens  
des 8.-11. Jahrhunderts im Spannungsfeld zwischen den verschiedenen Datierungsmöglichkeiten  
und ihren Einwänden ..... 145

## **Zwischen Ost und West? »Fremde« Schwerter in »lokalem« Kontext**

*Nada Profantová*

Examples of the most important results of technological analyses of swords  
in the Czech Republic ..... 169

*Ádám Bíró*

Dating (with) weapon burials and the »Waffenwechsel«. A preliminary report on new investigations of the so-called Viking-Age swords in the Carpathian Basin from a chronological point of view . . . . . 191

*Valeri Yotov*

The Kunágota sword guard and the dating of two bronze matrices for hilt manufacturing . . . . . 219

**Beiträge technologischer und naturwissenschaftlicher Untersuchungen  
zu archäologischen Fragestellungen**

*Adam Bollók*

Chronological questions of the Hungarian Conquest Period: a technological perspective . . . . . 229

*Susanne Greiff*

Silver grave goods from early Hungarian contexts: technological implications of debased alloy compositions with zinc, tin and lead . . . . . 241

*Nataša V. Eniosova*

Tracing the routes of silver procurement to the early urban centre Gnězdovo in the 10<sup>th</sup>/early 11<sup>th</sup> centuries . . . . . 261

*Mariela Inkova*

A contribution to the problem of producing the Old Bulgarian belt-fittings from the 10<sup>th</sup> century . . . . . 277

*Nada Profantová*

Ein tauschiefter Steigbügel aus der Umgebung von Dobruška (okr. Rychnov nad Kněžnou/CZ) . . . . . 295

Verzeichnis der Autorinnen und Autoren . . . . . 309

**Hinweis für den Leser:**

Kyрилliche Buchstaben wurden wissenschaftlich transliteriert. In Ausnahmefällen wurde bei Eigennamen auf eine wissenschaftliche Transliteration verzichtet. Bei den Fundortangaben in den Gebieten der ehemaligen Sowjetunion werden die heutigen Ortsnamen angegeben. Bei Kulturen bezeichnenden Fundorten wurde von einer Änderung abgesehen.

## **TRACING THE ROUTES OF SILVER PROCUREMENT TO THE EARLY URBAN CENTRE GNĚZDOVO IN THE 10<sup>TH</sup>/EARLY 11<sup>TH</sup> CENTURIES**

Whether formed into coins, ingots, jewellery or tableware – silver has been highly valued in Viking Age society and economy. A remarkable concentration of silver objects occurred at the Gnězdovo archaeological complex situated in the western part of Russia. It includes Scandinavian, Slavic and oriental ornaments, minted silver of oriental, Byzantine and West European origin and evidence for silver metalworking. The aim of this paper is to present some initial results from a study concerning the distribution of silver at the Gnězdovo settlements and cemeteries. I shall also discuss the origin of silver and revise the assumption that some of the monetary silver became Slavic and Scandinavian jewellery in the 10<sup>th</sup>/early 11<sup>th</sup> centuries, comparing the elemental composition of silver coinages, ornaments and scrap metal.

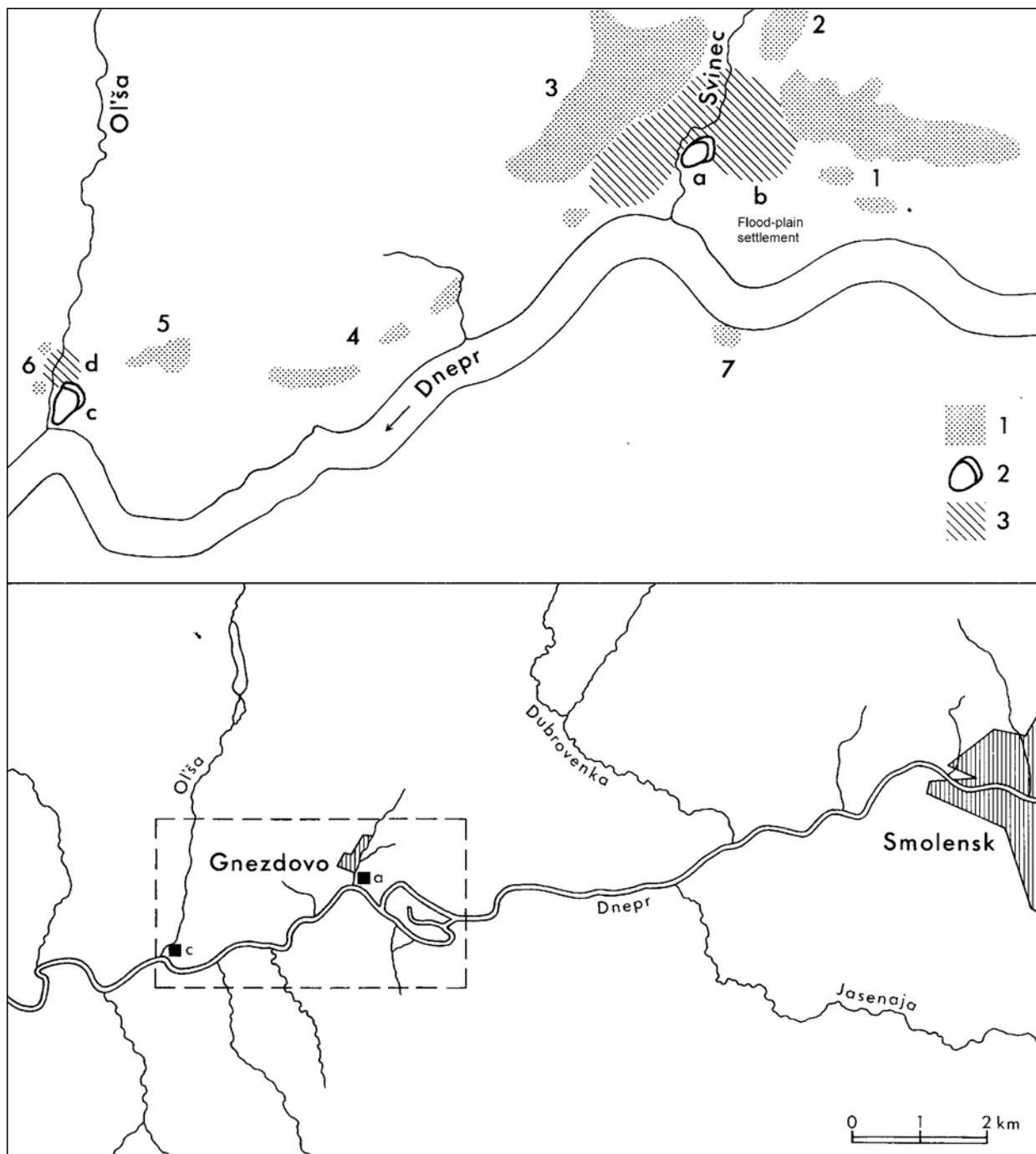
### **EARLY URBAN SITE GNĚZDOVO ACCORDING TO THE ARCHAEOLOGICAL EVIDENCE**

The Gnězdovo archaeological complex situated on the banks of the river Dnieper, ca. 12 km west of the present city of Smolensk, originally consisted of over 4,000 barrows dating to the early 10<sup>th</sup> to the early 11<sup>th</sup> centuries and several settlements covering more than 30 hectares (fig. 1). The central hillfort is located on a high outlier above the small tributary of the Dnieper. It is surrounded completely by the open settlements of the same period in the area of the first terrace as well as in the lower floodplain. About 7,000 m<sup>2</sup> of the central settlements have been explored by annual excavations since 1967. The second hillfort of uncertain age and less extensive open settlement remains are situated at the mouth of the river Ol'ša<sup>1</sup>.

Central and forest cemeteries which numbered some time ago 769 and 1,340 burial mounds respectively are the largest groups surrounding the central hillfort and open settlements on the banks of the Svineč river. Five small cemeteries with ca. 100-150 mounds were located in different parts of the complex. The most distant cemeteries are about 4 km west of the central settlements (Zaol'shanskaja group) and on the left bank of the Dnieper (left bank group). Until today, more than 1,200 graves from each of the eight cemeteries have been excavated; ca. 1,500 burial mounds remain. The total area of the Gnězdovo complex comprises about 200 hectares.

The name »Gnězdovo« drew the attention of historians and archaeologists in 1867 after the discovery of a famous hoard with luxury silver ornaments dated to the Viking Age during railroad construction<sup>2</sup>. The long-lasting excavations revealed the earliest settlement area in the southwestern part of the central hillfort, at the open settlement west of the Svineč river and at the floodplain. From the very beginning, Gnězdovo was settled by Scandinavians, Slavs and a local population belonging to the Long Barrow Culture<sup>3</sup>.

The finds brought to light by the excavations of the settlements and graves show that the Gnězdovo population played an important role in a network of trade and communication routes between the Baltic and the east via the Oka and Volga river systems and between the Baltic Sea and the Black Sea controlling the portages from the Dnieper to the Western Dvina and the Lovat-Volkhov. Many authors look upon Gnězdovo as the »service station« for travellers between northern river ways and the Dnieper. It is often argued



**Fig. 1** The Gnězdovo archaeological complex: **1** mound groups (1 forest group, 2 Gluščenkovskaja group [initially belonging to the forest group], 3 central group, 4 Dnieper group, 5 Olšanskaja group, 6 Zaoł'shanskaja group, 7 left bank group). – **2** Hillforts (a central, c Ol'shanskoe). – **3** Unfortified settlements (b central [east and west of the river Svineč], d Ol'shanskoe).

that the population of Gnězdovo was unstable, with an »influx or return flow« of travellers dependent on the change of seasons<sup>4</sup>. However, detailed analysis revealed a stable demographic structure of the Gnězdovo population based on the calculated proportion of male, female and child burials. The combined permanent population of the settlements averaged around 800-1,100<sup>5</sup>. It is evidence against the interpretation of Gnězdovo as a site for seasonal trade and production. A high level of iron, non-ferrous and pre-

cious metal metalworking, pottery manufacturing and bone and antler working testifies to a stationary character of the local production<sup>6</sup>. The osteologic collection and samples of cultivated plants together with the increased share of indicators of human economic activity in palynological diagrams show the important role of pasture farming and plant cultivation in the economy of Gnězdovo<sup>7</sup>.

Gnězdovo grew as an early urban centre inhabited by a multiethnic population of craftsmen, farmers, merchants and warriors and reached its zenith during the 10<sup>th</sup> century. In the 11<sup>th</sup> century, Gnězdovo surrendered its role to the developing Smolensk. Gradually it lost its importance as a trading and handicraft centre and became a small estate.

An impressive collection of artefacts found during the excavations comprises objects of different origin. There are numerous finds of belts and belt fittings mostly from the Volga Bulgaria territory, but the small groups of belt and harness accessories are from the Middle Dnieper area, Khazaria and Hungary<sup>8</sup>. Gnězdovo is notable for the largest quantity of truly Scandinavian objects outside northern countries<sup>9</sup>. A remarkable number of artefacts came to Gnězdovo as a result of direct and indirect contacts with Byzantium. A very modest group of artefacts indicates distant Slavic connections, comprising finds from the left bank of the Middle Dnieper (Romenskaja culture) and from Central Europe (Great Moravia). The rare exotic objects are of Anglo-Saxon and Iranian origin. A remarkable quantity of oriental silver concentrated in the ten hoards, rich burials and in the cultural layers of the Gnězdovo settlements<sup>10</sup>. In this paper I will focus on the extensive body of minted and unminted silver from the Gnězdovo hoards and on related numismatic finds from the long-lasting excavations of the settlements and mounds.

## THE GNĚZDOVO SILVER HOARDS: COIN FINDS FROM THE HOARDS AND THE EXCAVATIONS OF THE GNĚZDOVO CEMETERIES AND SETTLEMENTS

The material examined in this study is taken from the 10<sup>th</sup> century hoards which can be divided into four categories: a) coin hoards (2), b) coins combined with ornaments (6), c) coins combined with ornaments and weights (1), and d) coins combined with scale, weights and silver scrap (1). The hoards contained about 1,240 oriental coins, mostly Arabic dirhams, and none struck in the Byzantine Empire or in West Europe<sup>11</sup>. The latest calculation presents the following statistics on Arabic coins in the Gnězdovo hoards (**tab. 1**). Samanid dirhams coined at Samarkand, Shash, Bukhara, Andarabah, Balkh and Ma'din mints of the first half of the 10<sup>th</sup> century absolutely prevail in the Gnězdovo hoards. Abbasid and Buyid coins as well as Volga Bulgarian imitations are very rare. The fragmentation of silver is not considerable. Judging by the completely preserved complexes from the excavations, there were eight fragments in the hoard found in 1966/1975

hoard/category	place	total	dirhams	oldest coins	t. p. q.	other coins
1867 (b)	open settlement (east)	18	14	737/738	953/954	Sasanian (3) Indian (1)
1870 (b)	open settlement (east)	64	64	722	948/949	–
1885 (b)	settlement(?)	155	155	902/903	960/961	–
1909 (b)	open settlement (west)	781	781	884/885	953/954	–
1966/1975 (a)	open settlement (north)	51	51	895/896	924/925	–
1973 (a)	open settlement (east)	13	13	911/912	936/937	–
1993 (c)	open settlement (east)	72	72	896/897	950/951	–
2000 (d)	open settlement (east)	6	6	918/919	945/946	–
2001 (b)	open settlement (east)	71	71	903/904	953/954	–
2007 (b)	central hillfort	5	5	950s	950s	–

**Tab. 1** The 10<sup>th</sup> century hoards from Gnězdovo with Arabic coins.

mint	mounds	central hillfort	open settlement area	total
Sasanian	–	2	–	2
post-Sasanian	–	1	1	2
Umayyad	1	4	3	8
Abbasid	15	52	23	90
Samanid	49	25	22	101
imitations	4	1	11	16
unidentified Islamic dirhams	20	18	7	45
Byzantine	9	9	21	39
Western Europe	1	1	–	2
total	99	113	88	305

**Tab. 2** Distribution of coins from the Gnëzdovo cemetery and settlement area by date and region of production.

burials. The number of coins per grave varies from one to thirteen. Archaeological excavations in the settlement area since 1967 produced 201 coins (**tab. 2**). Oriental coins of Abbasid and Samanid issues clearly dominate in the numismatic material from Gnëzdovo. The earliest oriental coins from the settlement area are Sasanian drachmas attributed to the reign of Hormizd IV (579-590) and Khosrau II (590-628). There are also six Umayyad coins. The latest Islamic coin was issued by the Samanids in 962. The earliest coin from burials belongs to a Umayyad mint dated to 718/719; the latest was issued by the Ziyarids in 971.

30 Byzantine coins came from the central hillfort and the open settlements. Folles dominate in the Gnëzdovo selection. The earliest follis issued by the mint of Cherson is attributed to the reign of Justin I (518-527). The latest copper coin belongs to the last quarter of the 10<sup>th</sup>/first quarter of the 11<sup>th</sup> century. Ten coins were struck in Constantinople and Cherson in the 9<sup>th</sup> century. About one third of the folles and one miliaresion found in Gnëzdovo were remodelled to pendants with prestigious Christian symbols.

Three gold and five silver coins and one copper coin were transformed into female jewellery and placed in rich female single or double graves. Minted gold and silver from Byzantium were not used as a means of payment in Rus'. Their dissemination was due to diplomatic rather than to trade mechanisms. The most glamorous coin finds from Gnëzdovo were employed in jewellery as a form of wealth or reputation display indicating a particular lifestyle of the representatives of the upper social strata. They are also closely related to the gradual spread of Christianity from the Byzantine Empire since the middle of the 10<sup>th</sup> century<sup>12</sup>. West European coins are the smallest group of numismatic material from Gnëzdovo. A Carolingian silver denier is attributed to the reign of Charles the Bald. It was issued in Arras after 864<sup>13</sup>. This coin was remodelled to a pendant and placed with a necklace in a female inhumation grave L-124 (forest group) together with a Umayyad dirham minted in 718/719. The burial rite, the types of glass beads and metal ornaments point to the second part of the 10<sup>th</sup> century. The second coin transformed into a pendant was issued in Erfurt by Bardo, Archbishop of Mainz (1031-1051). It was found recently in the relatively late upper layer of the central hillfort sealing the 10<sup>th</sup> century deposits<sup>14</sup>.

Based on the distribution pattern of the coin finds in Gnëzdovo, we can conclude that coins issued in the 6<sup>th</sup>-9<sup>th</sup> century remained in circulation for decades or even centuries before they were deposited in cultural layers or graves<sup>15</sup>. It also suggests that the small groups of silver coins minted in Sasanian Iran, Byzantium or West Europe could not have been very important in the transactions. They were not attractive to the local workshops as a silver source. Judging by the coin finds, Gnëzdovo was involved in import and the use of Islamic silver on a considerable scale in the first decades of the 10<sup>th</sup> century. The numismatic material from Gnëzdovo confirms very clearly that there was a marked decline in the export of new dirhams in European Russia and in Sweden from the 950s on<sup>16</sup>.

and three fragments found in 1993. The fragmentation (22 fragments) is very impressive in the hoard of 2001, but it was recovered by illicit metal detecting. The two smallest hoards (2000, 2007) contain exclusively coin fragments (**tab. 1**).

In contrast to the coins found in the hoards, coin finds from the settlement territory and the mounds are much more diverse. Recent numismatic research shows that coins and coin pendants have been found in 51



The enormous wealth of Islamic silver found at Gnězdovo provides us with a good opportunity to reveal some characteristic features of the chemical composition of the coins issued by the different Caliphate provinces during the 9<sup>th</sup>-10<sup>th</sup> centuries and to evaluate them as a silver source for Slavic and Scandinavian jewellers in the 10<sup>th</sup> century. By tracing the origin of the silver produced in the different regions and mining fields, we tried to analyse a series of coins with complete numismatic data, including the year and the place of issue and the names of the rulers.

## METHODS OF INVESTIGATION

144 silver coins and 155 Slavic and Scandinavian ornaments from the Gnězdovo hoards were analysed in the Moscow State Historical Museum and in the Gold Room of the State Hermitage Museum in Saint Petersburg by a non-destructive method with portable ED-XRF equipment. A calculation of the weight concentration of elements without standards has been provided by a method of fundamental parameters. Quantitative data were obtained for silver, copper, lead, gold, bismuth and mercury. Silver and copper were present at concentrations well above the detection limit in all analyses. Detection limits for gold, bismuth and lead were estimated to be 0.01 %<sup>17</sup>.

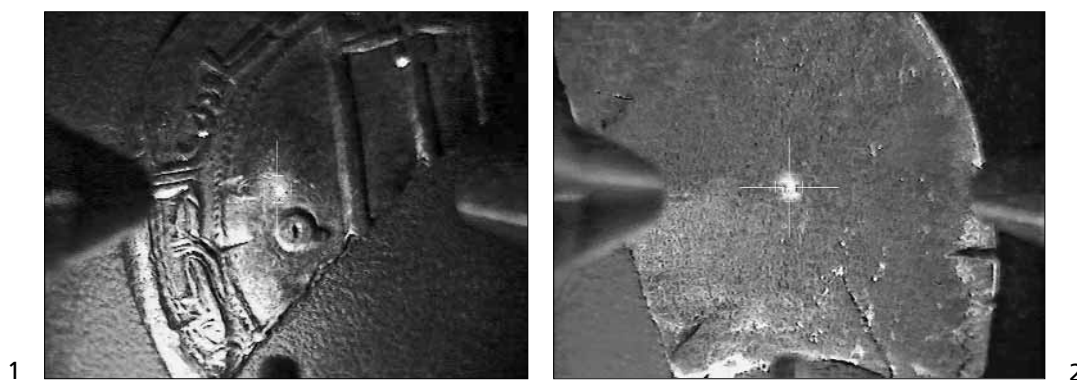
Surface corrosion and the preferential loss of copper from the surface of silver objects present difficulties for a non-destructive XRF analysis<sup>18</sup>. Experimental abrasions and measurements of the metal of two dirhams of unknown provenance with a different silver fineness provided information on a possible alteration of the results for pure and debased metal (**tab. 3; fig. 2, 1-2**).

The difference between a metal surface and the core is about 1 % for fine silver and almost 6 % for debased silver. Gold and bismuth concentrations are almost the same, even after cleaning. The lead level does not increase more than 2 %. Mercury detected on the surface of both samples was totally reduced after abrasion. Mercury in Arabic silver coins possibly reflects one of the ways to obtain silver: extracting noble metal from slag and processing the waste, according to Islamic writer Al Hamdani<sup>19</sup>. On the base of the data obtained for 2767 Central Asian dirhams by L. Ilisch, S. Lorenz, W. Stern and H. Steuer, the presence of elevated mercury concentrations has been established for the time between 170 and 220 AH (Islamic calendar)<sup>20</sup>. Despite the difficulties concerning surface enrichment, ED-XRF provides useful information on the provenance of silver from different sources, with different levels of impurities and trace elements. In order to reduce the surface enrichment effect, all visible corrosion products have been removed from the major portion of the analysed objects.

The microstructure of ten polished and etched specimens (fragmented dirhams from the cultural layers of the central hillfort), completely embedded in plastic, was investigated with the Axiovert 25 CA Inverted

sample	Harun ar-Rashid, Ma'din as-Salam 798/799 AD		Nuch b. Nasr 943-954 AD	
	before abrasive cleaning (fig. 2, 1)	after abrasive cleaning (fig. 2, 2)	before abrasive cleaning	after abrasive cleaning
Ag	95.66	94.51	90.83	84.18
Cu	0.37	0.46	1.50	6.87
Pb	1.04	2.52	1.50	3.43
Bi	–	–	3.27	3.50
Au	0.6	0.67	0.46	0.42
Hg	0.25	–	0.32	–

**Tab. 3** Surface and bulk silver composition before and after abrasive cleaning.



**Fig. 2** Abbasid dirham before (1) and after (2) abrasive cleaning.

Reflected Light Microscope (Zeiss). The peculiarities revealed by metallography are very important for determining the type of metal treatment.

## RESULTS AND DISCUSSION

### Coins

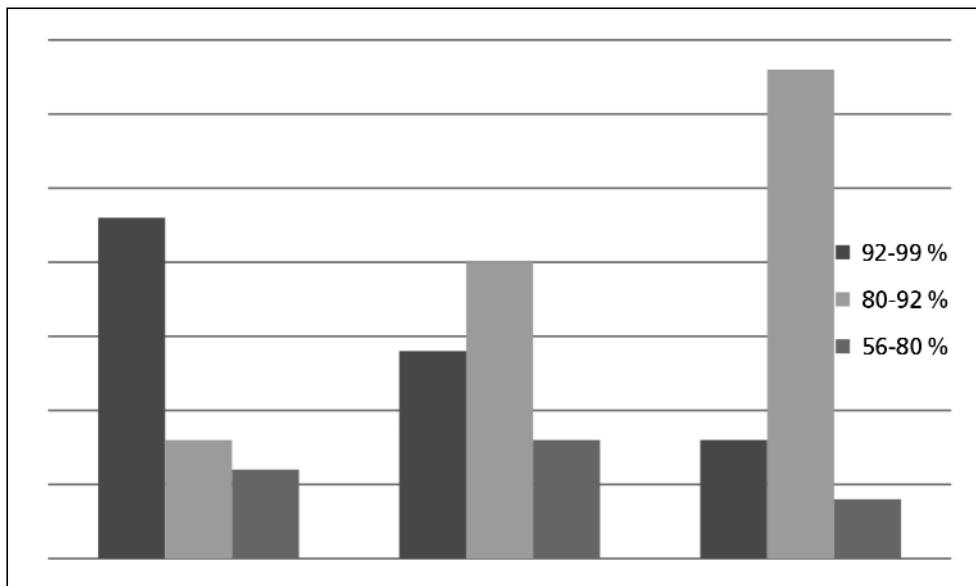
For the most part of the selection, the minted silver was of a good quality (over 80 %). There is a notable correlation between silver fineness and the mints. A relatively high and stable silver level was found for the mints of Andarabah, while more unstable and low silver concentrations are common for the coins struck in Shash and Samarkand (**fig. 3**). It has been suggested that galena or lead sulfide was one of the main sources of silver in the Islamic world. The argentiferous lead produced in the first smelt of galena would also contain copper, bismuth and gold. Lumps of ancient, unrefined silver found near the mines contain 4-15 % bismuth. This could only be reduced by repeated cupellation – which was, however, not always carried out<sup>21</sup>.

Laboratory experiments carried out by H. McKerrel and R. Stevenson revealed that copper, tin and zinc were reduced or totally removed after extensive cupellation. Gold »survives« cupellation completely. The bismuth content is unlikely to be reduced much below 1 % by cupellation. Therefore, gold and bismuth seem to be the useful elements for distinguishing silver sources<sup>22</sup>.

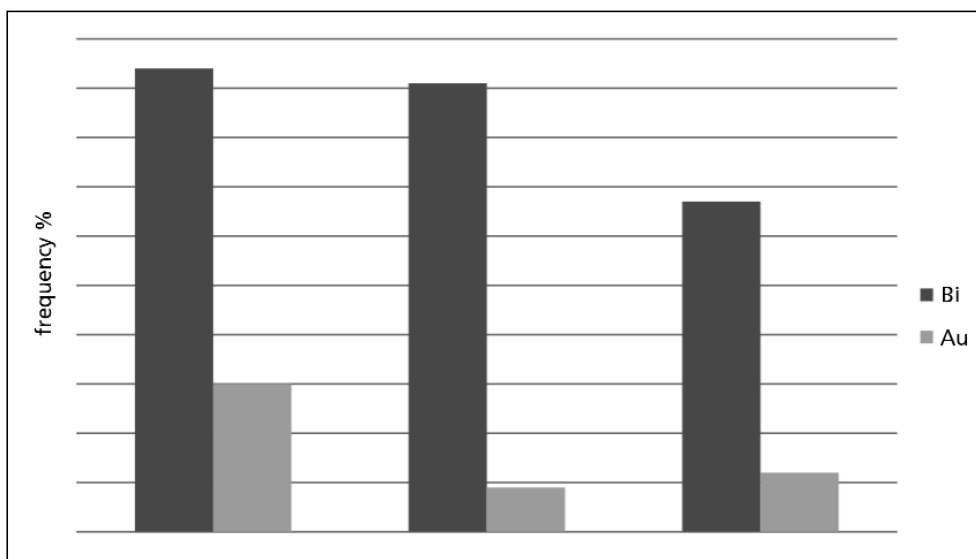
M. Cowell and N. Lowick found out that the silver minted in the Hindu Kush and derived from Panjshir valley galena deposits had a distinctive composition characterised by very low gold contents and relatively high bismuth contents<sup>23</sup>. However, a considerable extension of the existing data shows that some of the conclusions made on the basis of a limited number of analyses may have to be revised<sup>24</sup>.

The current study suggests that a high level of bismuth (over 0.1 %) is present in the coins struck in Transoxiana – more often than in dirhams from the Hindu Kush region. Mints of Shash, Samarkand and Andarabah-Balkh issued silver coins with a bismuth content ranging from 0.5 % to up to 15 % (**fig. 4**).

Some coins from the two regions of the Eastern Caliphate contain relatively high gold concentrations. The most impressive results were obtained for the Samarkand selection. 14 of 45 samples have a gold content ranging from 0.3 to up to 3 %. This points to a possible separate silver source supplying a local mint. Investigations based on experimental work showed that a high content of bismuth (> 1 %) dramatically reduces the deformation ability of silver: there is no way of using cold treatment without the appearance



**Fig. 3** Fineness of dirhams from the mints of Andarabah-Balkh, Shash and Samarkand (purity ranges from 62 to 99 % [Andarabah-Balkh], 56 to 96 % [Shash] and 73 to 95 % (Samarkand).

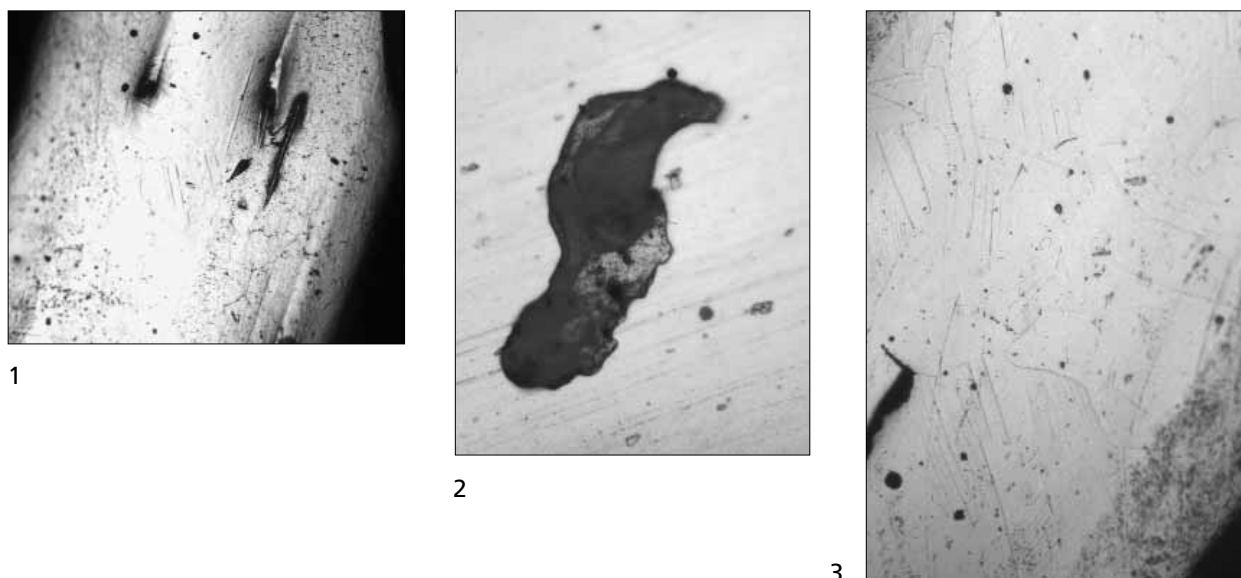


**Fig. 4** Frequency distribution of bismuth and gold in the silver of coins (45, 41 and 36 coins from Samarkand, Shash and Andarabah-Balkh mints were analysed).

of cracks<sup>25</sup>. Coins with a high content of bismuth, making metal brittle, sometimes have broken edges and a rough surface with a grid of tiny wrinkles (fig. 5, 1-2). However, the bismuth/silver ratio does not always correspond to the coin quality: there are several fine coins with a relatively high level of bismuth (fig. 5, 3). Presumably, fine coins have been selected deliberately to being converted into pendants. The coin quality depends on the dies and the final polishing. Skilful coin makers knew empirically about the difficulties with such a sort of metal and used special methods of coin production to reduce the dangerous influence of bismuth. More information about coin fabrication is given by the Arabic writers. They write

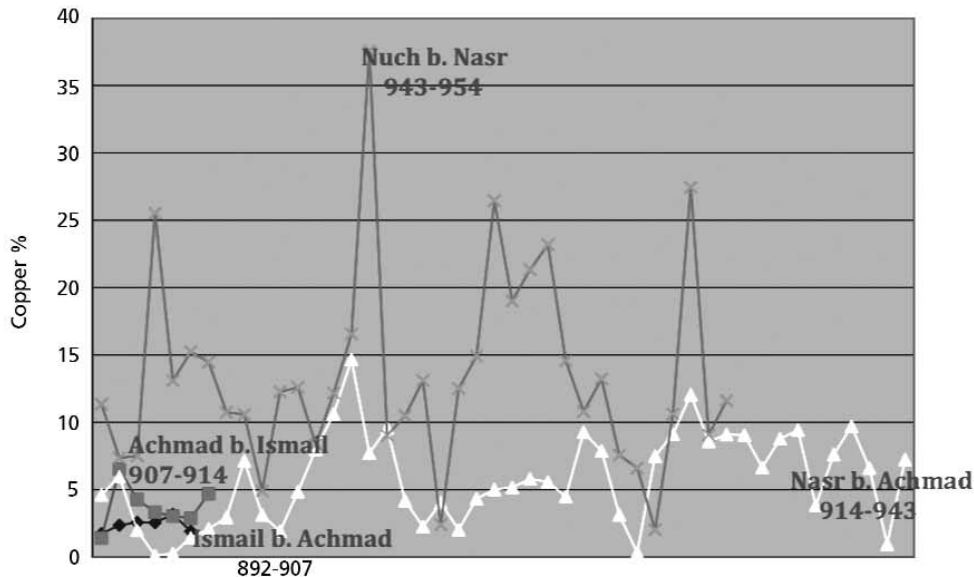


**Fig. 5** Dirhams with a high bismuth content from the hoard found in 1993: **1** Nuch b. Nasr, Bukhara, 947-948; Ag 65.02 %; Cu 25.51 %; Pb 1.79 %; Bi 7.69 %. – **2** Nasr b. Achmad, Sash, 936-937; Ag 82.89 %; Cu 6.44 %; Pb 4.98 %; Bi 4.48 %. – **3** Ismail b. Achmad, Balkh, 906-907; Ag 93.79 %; Cu 2.57 %; Pb 1.39 %; Bi 1.89 %; Au 0.36 %.



**Fig. 6** Cross-sections of the dirhams from the central hillfort excavations: **1** Ag 95.66 %; Cu 0.37 %; Pb 1.4 %; Au 0.6 %; Hg 0.25 %; parallel «stroked silver» inclusions point to an intensive surface treatment after stamping (magnification  $\times 100$ ; width of picture 0.3 mm; etched). – **2** Ag 96.98 %; Cu 0.28 %; Pb 2.01 %; Bi 0.73 %; a spot of «blue silver» in the metal structure (magnification  $\times 500$ ; width of picture 0.3 mm; before etching). – **3** Ag 9.66 %; Cu 0.49 %; Pb 1.52 %; Bi 3.33 %; recrystallised grains with annealing twins suggest that the coin had been made by means of hot forging and annealing; inner oxidation zones can be observed along the grain boundaries (magnification  $\times 200$ ; width of picture 0.3 mm; etched).

about the heating process applied before the steel stamp is pressed upon the dirham. The legends of these engravings appear on the coin clearly and correctly. According to the South Arabic author Al Hamdani, the newly stamped coins were polished with a particular kind of sand, salt and with manure at last<sup>26</sup>. Metallographic studies confirm the accuracy of the technological descriptions by the Arabic geographers. The metal structure shows that coins were produced by hot forging. Heavy deformation completely destroyed the initial structure of the cast bullion (fig. 6, 1). Oxide inclusions ( $\text{Cu}_2\text{O}$ ) in the form of grey-blue



**Fig. 7** Copper concentrations in the silver coins from Gnëzdovo struck between 301 and 343 AH (Islamic calendar). The horizontal line means the number of the samples from the Gnezdovo selection. It shows also how many samples, issued by the different rules of the Samanid dynasty (marked by the special symbols), were analyzed.

»clouds« (fig. 6, 2) and »stroked silver« (fig. 6, 3) point to an intensive surface treatment after stamping. »Clouds« and »strokes« were probably formed due to the polishing of the surfaces, with defects such as cracks and delamination. A final annealing at a temperature of 700°C caused the formation of inner oxidation zones<sup>27</sup>.

Finally, the data obtained by dirham analyses were supplemented by the information from the geological survey in modern Central Asia. Rich argentiferous lead ores occur within a large area of Ilaq known today as the Karamazar mining area stretched out over a huge distance within present-day Tajikistan, Uzbekistan and Kyrgyzstan. Extensive archaeological excavations have revealed numerous evidence of silver extraction in the Ilaq region, including crushed ore, slag heaps, litharge, smelting ovens, cupels and numerous tools of miners<sup>28</sup>. This testifies to the great scale of silver smelting in the 9<sup>th</sup>-11<sup>th</sup> centuries. The most impressive results were obtained for the Laškerek mine situated not so far from the modern city of Tashkent (UZ) in the upper basin of the Angren river. It was reported that 9,000 tons of slag containing 20 % lead were found here in 1929.

Geological research shows that the Laškerek polymetallic ores are extremely rich in silver, sometimes containing about 40 kg silver per ton. Native silver with 2 % copper and 0.1 % gold occurs in conglomerations of up to 1 cm in diameter, as thin veins and small disseminations in association with fahlore, galena, sphalerite and bornite. Bismuth was also detected in all galena associations. Its quantity grows considerably with the mine depth. Research suggests that Laškerek might be the richest Kuchisim mine mentioned by Islamic geographers<sup>29</sup>.

According to the Islamic writers, during the Samanid period Central Asia was second in silver production, right after the Panjshir region. It is clear today that the majority of the Samanid coins was issued by mints at Shash and Samarkand using silver of the local mines. However, the standard of the silver dirhams declined during the 10<sup>th</sup> and 11<sup>th</sup> centuries throughout the Islamic world from Spain to Central Asia<sup>30</sup>. The data arranged chronologically by issues of Samanid rules in the time between 892 and 953 AD shows a general downward trend in the middle of the 10<sup>th</sup> century (fig. 7). During the second half of the 10<sup>th</sup> century the copper content reached 35-40 %.

Apart from economical and political reasons, a lot of environmental problems lead to the decline of silver, including the exhaustion of silver-bearing ores, the almost complete depletion of the local forests, the lack of fuel and the extreme depth of the mines. The depth of the Laškerek mine reached up to 300 m<sup>31</sup>. Deeper mining operations were unlikely, for technical reasons but also because of the high bismuth content in the argentiferous ores. Finally, debased silver lost its value, and the dirham import to Eastern and Northern Europe came to an end. However, a large amount of Arabic coins remained in circulation within European Russia until the 1020s<sup>32</sup>.

## Jewellery

Seven hoards contained about 180 silver ornaments of a splendid quality, manufactured by casting, hammering, wire drawing, embossing metal sheets over metal dies, twisting, bending and joining separate components of an object. Some ornaments have traces of insignificant damage and repair. There are no fragmented pieces of jewellery or hack-silver.

The most elaborate group of jewellery includes more than 110 items decorated with filigree and granulation, the main part belonging to female ornaments. Morphological, stylistic and technological studies allow for identifying objects of Scandinavian, Slavic and oriental origin<sup>33</sup>. The last group includes just three belt mounts transformed into female jewellery. Temple rings of the »Volhynian type« (6), lunulae (22), circular-convex pendants (6) and one unique »Kaptorga-Kapselberlock« pendant (1), buttons (16) and some types of beads (60) are the most characteristic items of Slavic female jewellery.

The Scandinavian cultural area seems to be represented in six Gnëzdovo hoards by a large variety of jewellery, including massive hammered and twisted neck rings (6), annular armrings with twisted terminals formed from a rod of circular or rectangular sections (6), plane rings formed by forging with twisted terminals (4), luxurious circular brooches with applied bosses and animal figurines (2), cast pendants ornamented in the Borre and Jelling style belonging to the JP 155, 157 and 159 types (20), disk-shaped pendants with filigree and granulation ornamented with volutes and whorls (16), four unique pendants (cast male mask, three-dimensional hollow »valkyrie« figurine with filigree and granulation, circular pendant with the rare stepped motif, circular pendant showing a heraldic bird decorated in Scandinavian and Slavic fine metalworking traditions), and eight beads decorated with filigree spirals and three spindle-shaped beads made from beaded wire.



**Fig. 8** Circular pendant from the great Gnëzdovo hoard (1867, State Hermitage Museum, OAVES [= Отдел археологии Восточной Европы Сибири – The Department of Archaeology of Eastern Europe and Siberia]; inv. no. 994/44) consisting of an embossed panel with filigree and granulation and a plane substrate. Its design combines the northern tradition of filigree and granulation and Slavic geometrical elements.

There are no striking differences between Slavic and Nordic technological traditions. They mainly differ stylistically and sometimes both traditions have mixed in one single pattern (fig. 8). Slavic jewellery is easy to identify due to their regular geometrical patterns (fig. 9). Filigree plays a subordinate role in these pieces of jewellery: it mostly occupies the margins. Beaded wire is almost absent in the Slavic art of filigree and granulation dated to the 10<sup>th</sup> century. Irregular different-sized granules, the domination of beaded wire and the using of dies with an embossed relief are characteristic of Scandinavian precious metalwork (fig. 10). Did Slavic and Scandinavian craftsmen obtain their silver from the same sources?

It is assumed that the main part of the Viking Age jewellery was made of Arabic silver. We tried to check this hypothesis by comparing the silver content of the coins and of the ornaments from the hoards found in Gnëzdovo.



**Fig. 9** Lunula pendant with more than 2000 granules arranged in a geometrical pattern (1867, State Hermitage Museum, OAVES; inv. no. 994/86).



**Fig. 10** Three-dimensional hollow »valkyrie« figurine with filigree and granulation made with an embossed die (1867, State Hermitage Museum, OAVES; inv. no. 994/78).



**Fig. 11** Variety of silver fineness depending on the manufacturing technique: **1** cast pendant decorated in the Borre style made by mercury silvering (Ag 73.6%; Cu 14.67%; Bi 3.25%; Au 5.71%; Hg 3.20%; 1867, State Hermitage Museum, OAVES; inv. no. 994/58). – **2** Disk-shaped pendant with four filigree volutes placed on the flat substrate (Ag 97.4%; Cu 2.6%; the raise of gold and mercury on the front testifies to mercury silvering; 1867, State Hermitage Museum, OAVES; inv. no. 994/46).

A silver of high quality (over 90 %) was detected in the metal of the ornaments from the same hoards. The copper and lead contents of the objects are remarkably lower than the contents found in the coins. It testifies to the fact that silver cupellation in the workshops produced jewellery. Nevertheless, a high bismuth level detected in the silver ornaments shows that Arabic coins were the main source of silver for Slavic and Scandinavian craftsmen. It was detected in 65 of 155 samples. The bismuth concentrations in the ornaments are definitely lower than the concentrations in the coins. It also indicates silver cupellation and the ability to control the silver fineness. The silver content in the metal varies depending on the type of ornaments. The lowest silver fineness is found in cast and simply made jewellery, the highest in ornaments with filigree and granulation (fig. 11, 1-2).



1



2



3

**Fig. 12** Jewellery from the great Gnëzdovo hoard containing zinc or zinc/bismuth in silver: **1** oriental cast gilded belt mount (Ag 77.64 %; Cu 15.02 %; Zn 1.41 %; Pb 4.37 %; Au 1.23 %; Hg 0.33 %; 1867, State Hermitage Museum, OAVES; inv. no. 994/77). – **2** Cast pendant in the shape of a male mask (Ag 89.5 %; Cu 6.49 %; Zn 0.32 %; Bi 1.68 %; Au 2.1 %; 1867, State Hermitage Museum, OAVES; inv. no. 994/79). – **3** Circular brooch decorated in the Borre style with applied animal figurines, gilding and niello (Ag 62.8 %; Cu 31.6 %; Pb 3.39 %; Zn 1.85 %; Au 0.49 %; 1867, State Hermitage Museum, OAVES; inv. no. 994/92).

In the literature there is a wide spectrum of published results from chemical tests of silver jewellery. Atomic absorption spectrometry analyses of coins, ornaments and ingots from Swedish hoards of the Viking Age published by B. Hårdh indicate that ornaments decorated with granulation and filigree are made of high-proof silver (96 %). Bismuth was only detected in few cases. A lot of samples contain zinc which testifies to the fact that silver was diluted by brass. Anglo-Saxon coins contain significant quantities of zinc and tin. The presence of these elements is an important indicator for the secondary use of silver from the British Isles. Anglo-Saxon coins obtained in England since 991 as Danegeld possibly were the major source for the production of the massive armrings and neck rings found in Southern Sweden<sup>34</sup>.

B. Arrhenius, U. Linder Welin and L. Tapper published the results for silver ingots and armrings from Birka and Hässelby (Gotland/S). The armrings obviously derived from Arabic silver, as they contain no zinc and tin but bismuth and gold. However, the ingots from both sites were alloyed with bronze and brass. This proves the different sources of silver in Viking Age Sweden<sup>35</sup>. The gold/silver and bismuth/silver ratio found in Scottish Viking Age silver hoards point to different sources of the raw material, obtained from Islamic coins as well as from Anglo-Saxon coinage<sup>36</sup>.

Six pieces of jewellery from the biggest Gnëzdovo hoard (1867) contain zinc varying from 0.32 to 1.41 %. Zinc was detected in the metal of the oriental belt mount, the Scandinavian pendant and brooch (fig. 12,



1-3). The Scandinavian samples contain zinc and bismuth at the same time. The presence of such high contents of zinc and bismuth could be attributed to a remelting and reuse of diverse objects.

In spite of sufficient evidence for the manufacture of Scandinavian and Slavic jewellery from Arab silver, there was not one source of metal for the Viking Age craftsmen in the 10<sup>th</sup> century. More information from trace metal analyses is necessary, including lead isotope analyses to identify the provenance of sources. Hopefully further studies of objects and coins will help to define the problems discussed in this paper.

## CONCLUSIONS

Based on the results presented here, it can be concluded that coin finds from the early urban centre Gnězdovo provide good evidence for the use of coins in exchange transactions during the 10<sup>th</sup> century. Silver represents long-distance trade to the West and the East as well as local and regional exchange. According to the hoards and single finds, the arrival of oriental silver started in the first decade of the 10<sup>th</sup> century, reaching its maximum in the 940s-950s. The Arabic silver stream decreased and ceased in the 960s-970s. Judging from the dirham finds in the cultural layers of the settlements, a number of coins circulated in Gnězdovo up to the first decades of the 11<sup>th</sup> century. There is no evidence of alternative sources of silver from the Islamic world, Byzantium or Western Europe. It seems likely that the decrease of Arabic silver in the 960s-970s did not change the high quality of life of the Gnězdovo inhabitants. Series of dendrodates testify to the fact that extremely rich members of the local society were buried in the chamber graves during the last quarter of the 10<sup>th</sup> century<sup>37</sup>. Silver jewellery and coins are not rare in the cultural layers of the settlement area up to the early 11<sup>th</sup> century.

At Gnězdovo, dirham silver was not only dealt with as weighed silver bullions but also within the production of ornaments. Annual excavations in the settlement area produced increasing evidence for silver metalworking. There are coiled wire, light-weight ingots, waste material, shallow dishes for silver cupellation, crucibles and casting moulds containing silver and bismuth. Workshop remains dated to the second part of the 10<sup>th</sup> to the early 11<sup>th</sup> century were investigated in the central hillfort and the floodplain area. Casting moulds and dies originating from these workshops indicate the production of Scandinavian and Slavic jewellery<sup>38</sup>. However, in the absence of specific tools required for filigree and granulation work, there is no firm evidence for suggesting a local production of the luxurious jewellery from the Gnězdovo hoards<sup>39</sup>. Expensive female ornaments unified stylistically and technologically belonged to the upper strata of the local society. The composition and treatment of the objects in the hoards indicate that they are presumably the result of trade transactions, raids or retainers payments. Two hoards (1867, 1993) contain large sets of undamaged ornaments which seem to represent family treasures used for trade transactions if needed. A hoard (2000) with a set of weights and a balance, coiled wire and fragmented dirhams could possibly be classified as »manufacturing«.

## Acknowledgments

I would like to thank the staff of the State Historical Museum in Moscow: Dr. Aleksej V. Fomin for his numismatic attributions, Dr. Natal'ja G. Nedošivina and Svetlana A. Avdusina for their support in this study of the hoards. Dr. Rafail S. Minasjan from the State Hermitage Museum in Saint Petersburg helped me to examine silver from the Gold Room. I would like to thank Dr. Tamara A. Puškina from the Moscow State University for the permission to study and publish the material from her excavations in Gnězdovo. A

thank you also goes to Dr. Robert A. Mitojan from the Geological Department of the Moscow State University for his kind assistance in the ED-XRF analysis of the silver. The English text was revised by Dr. Beate Reibold and Evelyn Garvey.

All photos by N. V. Eniosova; obtained with the kind permission of the State Historical Museum in Moscow and the State Hermitage Museum in Saint Petersburg

## Notes

- 1) Puškina 1974.
- 2) Puškina 1998.
- 3) Avdusin 1991, 13-17.
- 4) Bulkin / Lebedev 1974, 12 f.; Shepard 1995, 258.
- 5) Žarnov 1992, 164 f. 169.
- 6) Eniosova 2002, 5-16; Puškina / Rozanova 1992, 200-219.
- 7) Kir'janova / Puškina 2008.
- 8) Eniosova / Muraševa 1999.
- 9) Puškina 1997.
- 10) Puškina 2000.
- 11) Ibidem; 2009.
- 12) Kropotkin 1962, 11-13; Boguslavskij 1995, 90 f.
- 13) Previously, this coin was regarded as a denier minted in Flanders (989-1036) (Ravdina 1988, 46).
- 14) Puškina / Stukalina in print.
- 15) Bálint 1981, 106-108.
- 16) Noonan 1989, 422-424.
- 17) Eniosova / Koloskov / Mitojan 2002.
- 18) Kruse / Tate 1992, 298 f.; Ilisch et al. 2003, 31-34.
- 19) Craddock 1995, 214-216.
- 20) Ilisch et al. 2003, 37 f.
- 21) Craddock 1995, 221.
- 22) McKerrell / Stevenson 1972, 197 f.
- 23) Cowell / Lowick 1988, 71 f.
- 24) Ilisch et al. 2003, 31.
- 25) Hatz et al. 1991, 72 f.; 138 fig. 332-335.
- 26) Toll 1970-1971, 131 f.
- 27) Brepohl 2000, 51. 180.
- 28) Burjakov 1974, 8-15.
- 29) Dunin-Barkovskij 1959.
- 30) Davidovič 1966, 115-118; Steuer / Stern / Goldenberg 2002, 152 f.; 153 fig. 12.
- 31) Masson 1953, 32 f.
- 32) Noonan 1989, 446.
- 33) Korzuchina 1954, 87-89; Eniosova / Puškina 1997.
- 34) Härdh 1976, 110-112. 115-119.
- 35) Arrhenius / Linder Welin / Tapper 1972-1973.
- 36) Kruse / Tate 1992, 323 f.
- 37) Avdusin / Puškina 1988.
- 38) Eniosova 2002; Muraševa / Eniosova / Fetisov 2007, 59-61.
- 39) Armbruster 2010.

## References

- Armbruster 2010: B. Armbruster, Remains of the Viking-Age Goldsmith's Craft and Workshop. In: B. Ludowici / H. Jöns / S. Kleingärtner / J. Scheschkewitz / M. Hardt (eds), Trade and Communication Networks of the First Millennium AD in the Northern Part of Central Europe. Neue Studien zur Sachsenforschung 1 (Hannover 2010) 191-214.
- Arrhenius / Linder Welin / Tapper 1972-1973: B. Arrhenius / U. S. Linder Welin / L. Tapper, Arabiskt silver och nordiska vikingasmykken. *Tor* 15, 1972-1973, 151-159.
- Avdusin 1991: Д. А. Авдусин, Актуальные вопросы изучения древностей Смоленска и его ближайшей округи. In: Д. А. Авдусин (ed.), Смоленск и Гнездово (к истории древнерусского города) (Moskva 1991).
- Avdusin / Puškina 1988: D. A. Avdusin / T. A. Puškina, Three Chamber-Graves from Gnezdovo. *Fornvännen* 83, 1988, 20-33.
- Bálint 1981: Cs. Bálint, Einige Fragen des Dirhem-Verkehrs in Europa. *Acta Arch. Acad. Scien. Hungaricae* 33, 1981, 105-131.
- Boguslavskij 1995: O. I. Богуславский, Об одном круге древностей Юго-Восточного Приладожья (к проблеме распространения христианства на Северо-Западе Руси). *Cerkovnaja Archeologija* 1 (Saint Petersburg, Pskov 1995) 90-94.
- Brepohl 2000: E. Brepohl, Theorie und Praxis des Goldschmieds (Moskva 2000).
- Bulkin / Lebedev 1974: В. А. Булкин / Г. С. Лебедев, Гнездово и Бирка (к проблеме становления города). In: А. Н. Кирпичников / П. А. Раппопорт (eds), Культура средневековой Руси (Leningrad 1974) 11-18.
- Burjakov 1974: Ю. А. Буряков, Горное дело и металлургия средневекового Илака (Moskva 1974).
- Cowell / Lowick 1988: M. R. Cowell / M. N. Lowick, Silver from the Panjhir Mines. In: W. A. Oddy (ed.), *Metallurgy in Numismatics 2* (London 1988) 65-74.
- Craddock 1995: P. T. Craddock, Early Metal Mining and Production (Edinburgh 1995).
- Davidovič 1966: Е. А. Давидович, Денежное обращение в Мавераннахре при Саманидах. *Numizmatika i Ėpigrafika* 6, 1966, 92-131.
- Dunin-Barkovskij 1959: П. Л. Дунин-Барковский, К серебряности месторождения Лашкерек. *Uzbekskij Geol. Žurnal* 2, 1959, 62-67.
- Eniosova 2002: Н. В. Ениосова, Ювелирное ремесло раннегородского центра Гнездова. *Vestnik Rossijskogo Gumanitarnogo Naučnogo Fonda* 3, 2002, 5-16.
- Eniosova / Muraševa 1999: N. V. Eniosova / V. V. Muraševa, Manufacturing Techniques of Belt and Harness Fittings of the 10<sup>th</sup> Century AD. *Journal Arch. Scien.* 26, 1999, 1093-1100.
- Eniosova / Puškina 1997: N. V. Eniosova / T. A. Puškina, Some Technological Aspects of Fine Metalworking in Gnezdovo: an Analysis of the Hoards from Upper Dnieper Region. In: G. De Boe / F. Verhaeghe (eds), *Art and Symbolism in Medieval Europe*. Medieval Europe Brugge 1997 5 (Brugge 1997) 65-71.
- Eniosova / Koloskov / Mitojan 2002: N. V. Eniosova / S. A. Koloskov / R. A. Mitojan, Application of Non-Destructive Quantitative X-Ray Fluorescent Spectrometry to Ancient Non-Ferrous Alloys. In: R. Van Grieken / K. Janssen / L. Van't dack / G. Meersman (eds), *Proceedings of 7<sup>th</sup> International Conference on Non-Destructive Testing and Microanalysis for the Diagnostics and Conservation of the Cultural and Environmental Heritage* (Antwerp 2002) 1-6.

- Hårdh 1976: B. Hårdh, Wikingerzeitliche Depotfunde aus Südschweden. Probleme und Analysen. Acta Archaeologica Lundensia, Series in Octavo Minore 6 (Bonn 1976).
- Hatz et al. 1991: G. Hatz / V. Hatz / U. Zwicker / N. Gale / Z. Gale, Otto-Adelheid-Pfennige. Untersuchungen zu Münzen des 10./11. Jahrhunderts. Commentationes de Nummis saeculorum IX-XI in Suecia repertis N.S. 7 (Stockholm 1991).
- Ilisch et al. 2003: L. Ilisch / S. Lorenz / W. Stern / H. Steuer, Dirham und Rappenpfennig. Mittelalterliche Münzprägung in Bergbauregionen. Analysenreihen. Zeitschr. Arch. Mittelalters Beih. 17 (Bonn 2003).
- Kir'janova / Puškina 2008: Н. А. Кирьянова / Т. А. Пушкина, Сельскохозяйственная деятельность населения Гнездова. In: Н. А. Макаров / С. З. Чернов (eds), Сельская Русь в IX-XVI вв (Moskva 2008) 171-177.
- Korzuchina 1954: Г. Ф. Корзухина, Русские клады IX-XIII вв. (Moskva 1954).
- Kropotkin 1962: В.В. Кропоткин, Клады византийских монет на территории СССР. Svod Archeologičeskich Istočnikov E4-4 (Moskva 1962).
- Kruse / Tate 1992: S. E. Kruse / J. Tate, XRF Analysis of Viking Age Silver Ingots. Proc. Soc. Ant. Scotland 122, 1992, 295-328.
- Masson 1953: М. Е. Массон, К истории горного дела на территории Узбекистана. Izdatel'stvo Akademii nauk UzSSR (Taškent 1953).
- McKerrel / Stevenson 1972: H. McKerrel / R. B. K. Stevenson, Some Analyses of Anglo-Saxon and Associated Oriental Silver Coinage. In: E. T. Hall / D. M. Metcalf (eds), Methods of Chemical and Metallurgical Investigation of Ancient Coinage. Royal Num. Soc., Special Publ. 8 (London 1972) 195-209.
- Muraševa / Eniošova / Fetisov 2007: В. В. Мурашева / Н. В. Ениосова / А. А. Фетисов, Кузнечно-ювелирная мастерская в пойменной части Гнездовского поселения. In: В. В. Мурашева (ed.), Гнездово. Результаты комплексных исследований памятника (Saint Petersburg 2007) 31-77.
- Noonan 1989: T. S. Noonan, The Impact of the Silver Crisis in Islam Upon Novgorod's Trade with the Baltic. Ber. RGK 69, 1988, 411-447.
- Puškina 1974: Т. А. Пушкина, Гнездовское поселение в истории Смоленского Поднепровья [unpubl. diss., Moscow State Univ. 1974].
- 1997: T. A. Puškina, Scandinavian Finds from Old Russia. A Survey of Their Topography and Chronology. In: P. Hansson (ed.), The Rural Viking in Russia and Sweden (Örebro 1997) 83-92.
- 1998: Т. А. Пушкина, Первые Гнездовские клады: история открытия и состав. In: В. Л. Янин (ed.), Историческая археология. Традиции и перспективы (Moskva 1998) 370-377.
- 2000: T. A. Puškina, Les trouvailles monétaires de Gnezdovo: un marqueur des relations commerciales. In: M. Kazanski / A. Nersessian / C. Zuckerman (eds), Les centres proto-urbains russes entre Scandinavie, Byzance et Orient. Réalités byzantines 7 (Paris 2000) 215-224.
- 2009: Т. А. Пушкина, Новые монетно-вещевые клады из Гнездова. In: Н. А. Макаров / П. Г. Гайдуков / Н. В. Лопатин / Вл. В. Седов (eds), Великий Новгород и Средневековая Русь (Moskva 2009) 525-532.
- Puškina / Rozanova 1992: Т. А. Пушкина / Л. С. Розанова, Кузнечные изделия Гнездова. (Blacksmith's Production from Gnezdovo). Rossijskaja Arch. 1992 / 2, 200-220.
- Puškina / Stukalina in print: Т. А. Пушкина / Т. Ю. Стукалина, Средневековые западноевропейские монеты в нумизматической коллекции Гнездова (in print).
- Ravdina 1988: Т. В. Равдина, Погребения X-XI вв. с монетами на территории Древней Руси (Moskva 1988).
- Shepard 1995: J. Shepard, Constantinople – Gateway to the North: the Russians. In: C. Mango / G. Dagron (eds), Constantinople and Its Hinterland. Publications of the Society for the Promotion of Byzantine Studies 3 (Aldershot 1995) 243-260.
- Steuer / Stern / Goldenberg 2002: H. Steuer / W. Stern / G. Goldenberg, Der Wechsel von der Münzgeld- zur Gewichtsgeldwirtschaft in Haithabu um 900 und die Herkunft des Münzsilbers im 9. und 10. Jahrhundert. In: K. Brandt / M. Müller-Wille / Ch. Radtke (eds), Haithabu und die frühe Stadtentwicklung im nördlichen Europa. Schriften des Archäologischen Landesmuseums 8 (Neumünster 2002) 133-167.
- Toll 1970-1971: C. Toll, Minting Technique According to Arabic Literary Sources. Orientalia Suecana 19-20, 1970-1971, 125-139.
- Žarnov 1992: Ю. Э. Жарнов, Погребальный обряд в Древней Руси по материалам Гнездовского некрополя [unpubl. diss., Moscow State Univ. 1992].

### *Abstract / Zusammenfassung / Резюме*

#### **Tracing the routes of silver procurement to the early urban centre Gnëzdovo in the 10<sup>th</sup>/early 11<sup>th</sup> centuries**

It has long been known that during the Viking Age huge quantities of Islamic silver coins were exported from the Islamic world and deposited throughout European Russia, Ukraine, the Baltic lands and Scandinavia. A remarkable concentration of oriental silver occurred at the Gnëzdovo settlement situated in the western part of Russia along the river Dnieper near the city of Smolensk.

This paper presents the results of a combined archaeological and scientific study of the extensive body of minted and unminted silver from the Gnëzdovo hoards and of related numismatic finds from the long-lasting excavations of the settlements and mounds.

Silver coins and jewellery from the Gnëzdovo hoards were analysed in Moscow and Saint Petersburg by a non-destructive method with portable ED-XRF equipment. For the most part of the selection, the minted silver was of a good quality (over 80 %). The data arranged chronologically by mint in the time between 914 and 953 AD shows a general downward trend in the middle of the 10th century. A high level of bismuth and gold is detected in the coins struck in

Transoxiana. The data obtained by the dirham analyses has been supplemented by information from the geological surveys of modern Middle Asia.

A high quality of silver (over 90 %) has been detected in the jewellery metal from the same hoards. The copper, lead and bismuth contents of unminted silver are remarkably lower than the contents in the coins. Elemental analyses of Slavic and Scandinavian silver do not provide an absolute indication of the silver source. Nevertheless, a high bismuth level detected in silver ornaments shows that Arabic coins were the main source of silver for Slavic and Scandinavian craftsmen.

#### **Suche nach dem Weg des Silbers ins frühurbane Zentrum von Gnězdovo im 10. und frühen 11. Jahrhundert**

Schon lange ist bekannt, dass während der Wikingerzeit große Mengen an islamischen Silbermünzen von der islamischen Welt aus in den europäischen Teil Russlands, die Ukraine, das Baltikum und nach Skandinavien gelangten und dort deponiert wurden.

Dieser Artikel zeigt die Ergebnisse der archäologischen und naturwissenschaftlichen Untersuchung der großen Zahl geprägten und ungeprägten Silbers aus den Hortfunden von Gnězdovo sowie der vergleichbaren numismatischen Funde, die während der jahrelangen Grabungen in den Siedlungsplätzen und Grabhügeln der Umgebung gefunden wurden.

Die Silbermünzen und der Schmuck aus den Hortfunden von Gnězdovo wurden in Moskau und St. Petersburg mittels eines tragbaren ED XRF-Geräts zerstörungsfrei analysiert. Der größte Teil der untersuchten Silbermünzen war von guter Qualität (über 80 % Silber). Bei der chronologischen Aufschlüsselung der Analyseergebnisse von 914-953 n. Chr. zeigte sich ein Abwärtstrend im Silbergehalt in der Mitte des 10. Jahrhunderts. Einen hohen Wismut- und Goldgehalt wiesen vor allem die in Transoxanien geprägten Münzen auf. Die Analyseergebnisse der Dirhems wurden mit den Informationen aus den geologischen Surveys im heutigen Mittelasien verglichen.

Eine hohe Silberqualität wurde auch bezüglich des Schmucks der Hortfunde aus Gnězdovo festgestellt (über 90 % Silber). Kupfer-, Blei- und Wismutspuren in ungeprägtem Silber sind viel niedriger als in den Münzen. Spurenelementanalysen an slawischem und skandinavischem Silber erbrachten bisher keine genaue Lokalisierung der Abbaugebiete. Trotzdem kann anhand des vorhandenen hohen Wismutgehalts in den Schmuckstücken darauf geschlossen werden, dass arabische Münzen die Hauptrohmaterialquelle für die Schmuckerzeugung durch slawische und skandinavische Handwerker darstellten.

#### **Пути поступления серебра в раннегородской центр гнездово в X - начале XI века**

В эпоху викингов из исламского мира было импортировано огромное количество серебряных монет, спрятанных в кладах на территории Европейской России, Украины, Прибалтики и Скандинавских стран. Исключительное место среди поселений Восточной Европы по концентрации серебра занимает Гнездовский археологический комплекс, обнаруженный неподалеку от Смоленска на берегу Днепра. В этом важном центре дальней торговли найдено два монетных и восемь денежно-вещевых кладов. В работе представлены результаты археологического и аналитического изучения монетного серебра и украшений из гнездовских кладов, погребений и различных участков поселения, раскопки которых ведутся в течение длительного времени. Химический состав металла серебряных монет и украшений славянского и скандинавского происхождения из Гнездовских кладов был исследован с помощью портативного рентгенофлуоресцентного прибора с использованием методики неразрушающего анализа в фондах Государственного Исторического Музея и Государственного Эрмитажа. Дирхемы получены из серебра различной пробы, но в большинстве случаев она достаточно высокая (> 80%). Прослеживается определенная корреляция между концентрацией серебра и местом чеканки. Данные о химическом составе металла дирхемов, представленные в хронологической последовательности в период между 914 и 953 гг., показывают значительное уменьшение серебра в пробах уже в середине X в. В монетах среднеазиатской чеканки часто обнаруживается повышенная концентрация висмута и золота. Результаты исследования химического состава серебра дирхемов дополнены информацией о средневековых серебряных рудниках, полученной в ходе геологической разведки на территории современной Средней Азии.

Изучение элементного состава украшений Гнездовских кладов показало, что большая их часть сделана из очень чистого серебра (> 90%). По сравнению с монетами медь, свинец и висмут присутствуют в значительно меньших концентрациях. Высокое содержание висмута, зафиксированное в славянских и скандинавских украшениях из кладов, показывает, что арабское серебро было их главным источником сырья.

## AUS DEM VERLAGSPROGRAMM



Monographien des RGZM  
Band 64 (2. Auflage 2006)  
315 S. mit 197 Abb., 12 Farbtaf.  
ISBN 3-88467-094-8  
48,- €

Falko Daim · Ernst Laueremann (Hrsg.)

### Das frühungarische Reitergrab von Gnadendorf (Niederösterreich)

Das Reitergrab von Gnadendorf ist aus verschiedenen Gründen außergewöhnlich. Zunächst wurde es außerhalb des damaligen ungarischen Siedlungsgebietes angelegt, weiters handelt es sich bei dem Bestatteten um einen 14-jährigen, kampferfahrenen Jungen, und drittens verfügt das Grab über eine vorzügliche Ausstattung. Das Grab wirft einige grundlegende Fragen auf, denn sämtliche Fundgegenstände scheinen lange in Gebrauch gewesen zu sein. Außerdem haben zwei <sup>14</sup>C-Datierungen einen Bestattungszeitpunkt erst um das Jahr 1000 ergeben. Treffen die naturwissenschaftlichen Datierungen zu, stellt sich die Frage, warum man den Knaben weit weg von den ungarischen Siedlungen mit wertvollen, aber teils sehr alten Sachen bestattet hat. Bedenkt man, dass der ungarische Stammesbund um die Jahrtausendwende die Umstrukturierung zu einem »modernen« mittelalterlichen Staat auf christlichen Grundlagen erlebte, könnte es sein, dass die Bestattung von Gnadendorf als Demonstration gegen diese Veränderung gedacht war.

Das vorliegende Buch enthält neben einer detaillierten Fundvorlage zahlreiche Studien, die »den Fall Gnadendorf« aus unterschiedlichen Perspektiven beleuchten.



Mosaiksteine. Forschungen am RGZM  
Band 2 (2., verbesserte Auflage 2007)  
68 S. mit 49 Farb- u. 29 sw-Abb.  
ISBN 3-88467-101-4  
16,50 €

Falko Daim (Hrsg.)

### Heldengrab im Niemandsland Ein frühungarischer Reiter aus Niederösterreich

»Heldengrab im Niemandsland« erscheint anlässlich der gleichnamigen Kabinettausstellung des RGZM im Kurfürstlichen Schloß Mainz (14. September bis 19. November 2006). Das aufwändig ausgestattete Werk fasst in mehreren Beiträgen die Forschungsergebnisse zum Grab von Gnadendorf sowie zum historisch-archäologischen Umfeld zusammen. Ein umfassender Artikel von Mechthild Schulze-Dörlamm thematisiert darüber hinausgehend die archäologischen Belege für die frühungarischen Raubzüge in der ersten Hälfte des 10. Jahrhunderts. Die lange Zeit fast unbesiegbaren Reiter gelangten bis nach Oberitalien, an die Atlantikküste und die heutige dänische Grenze, bis sie 955 vom Heeresaufgebot König Ottos I. bei Augsburg vernichtend geschlagen werden konnten.

Verlag des Römisch-Germanischen Zentralmuseums, Mainz

Ernst-Ludwig-Platz 2 · 55116 Mainz · Tel.: 0 61 31/91 24-0 · Fax: 0 61 31/91 24-199  
E-Mail: verlag@rgzm.de · Internet: www.rgzm.de · www.shop.rgzm.de

## AUS DEM VERLAGSPROGRAMM

Lutz Grunwald · Heidi Pantermehl · Rainer Schreg (Hrsg.)

### Hochmittelalterliche Keramik am Rhein

Eine Quelle für Produktion und Alltag  
des 9. bis 12. Jahrhunderts

Durch die Tagung »Hochmittelalterliche Keramik am Rhein« gelang es, für das 9. bis 12. Jahrhundert eine Bilanz des derzeitigen Forschungsstands zu diesem »Leitfossil« der archäologischen Wissenschaft zu ziehen. Der vorliegende Band bietet mit seinen 21 Beiträgen nicht nur einen wichtigen Überblick über den aktuellen Forschungsstand zur entlang des Rheins anzutreffenden hochmittelalterlichen Keramik. Ausgehend von den unterschiedlichsten, in der Schweiz, Frankreich, Deutschland und den Niederlanden angesiedelten Forschungsvorhaben erweitert er darüber hinaus den Blick von einzelnen Fundstellen und Töpferregionen auf überregionale Betrachtungen und Zusammenhänge hinsichtlich der Warenarten, ihrer Produktion und des Handels mit keramischen Gütern. Einige Beiträge liefern für bestimmte Regionen am Rhein zudem erstmals eine Beschreibung der dort in dieser Zeit vorhandenen Tonwaren. In der Zusammenschau der Einzeldarstellungen ergeben sich neue Einblicke sowohl in die regionale Wirtschaftsgeschichte als auch in die großräumigen Entwicklungstendenzen, die in dieser Epoche das Leben und den Alltag der Menschen entlang des Rheins prägten.



RGZM – Tagungen, Band 13  
1. Auflage 2012, 262 S.  
mit 127 z. T. farb. Abb.  
ISBN 978-3-88467-191-7  
37,- €



Monographien des RGZM, Band 80,1-2  
2 Bände, zus. 438 S., 120 Abb.,  
240 Farbtaf., 4 Beil.  
ISBN 978-3-88467-133-7  
272,- €

Hajanalka Herold

### Zillingtal (Burgenland)

Die Awarerzeitliche Siedlung und die Keramikfunde  
des Gräberfeldes

Die Bearbeitung der frühmittelalterlichen Siedlung (7.-8. Jahrhundert n. Chr.) sowie der Keramikfunde des zugehörigen Gräberfeldes konzentriert sich auf drei Schwerpunkte: awarenzeitliche Siedlungsbefunde und Siedlungsstrukturen im Karpatenbecken, Keramikproduktion und Keramikgebrauch in der Awarerzeit sowie awarenzeitliche Traditionen in Zillingtal bei der Beigabe von Keramikgefäßen ins Grab.

Bei den Siedlungsbefunden interessiert vor allem die frühmittelalterliche Wiederverwendung der römischen Ruinen. Die Auswertung des Fundmaterials konzentriert sich auf die Keramikfunde, mit denen zusammen auch die Keramikgefäße des awarenzeitlichen Gräberfeldes untersucht werden. Dazu dienen archäologische und archäometrische Analysen sowie Methoden der experimentellen Archäologie. Die gewonnene Chronologie der Grabgefäße und die anthropologischen Daten der Bestatteten bilden die Basis für die Analyse der awarenzeitlichen Traditionen bei der Beigabe von Keramikgefäßen in die Gräber.

Verlag des Römisch-Germanischen Zentralmuseums, Mainz

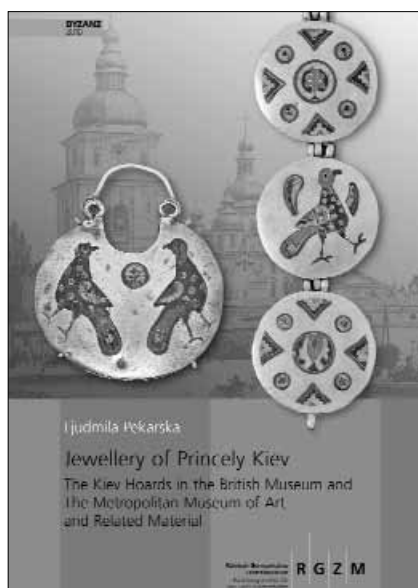
Ernst-Ludwig-Platz 2 · 55116 Mainz · Tel.: 0 61 31/91 24-0 · Fax: 0 61 31/91 24-199  
E-Mail: verlag@rgzm.de · Internet: www.rgzm.de · www.shop.rgzm.de

## AUS DEM VERLAGSPROGRAMM

Ljudmila Pekarska

### Jewellery of Princely Kiev

The Kiev Hoards in the British Museum and The Metropolitan Museum of Art and Related Material



In the capital of Kievan Rus', princely Kiev, almost 70 medieval hoards have been discovered to date. The hoards contained gold and silver jewellery of the ruling dynasty, nobility and the Christian Church. They were unique to Kiev and their quantity and magnificence of style cannot be matched by anything found either in any other former city of Rus', or in Byzantium. Most of the objects never had been published outside the former Soviet Union. During the 17<sup>th</sup>-20<sup>th</sup> centuries, many medieval hoards were gradually unearthed; some disappeared soon after they were found. This book provides a complete picture of the three largest medieval hoards discovered in Kiev: in 1906, 1842 and 1824, and traces the history and whereabouts of other lost treasures. Other treasures took pride of place in some of the world's top museums.

This publication highlights the splendid heritage of medieval Kievan jewellery. It illustrates not only the high level of art and jewellery craftsmanship in the capital, but also the extraordinary religious, political, cultural and social development of Kievan Rus', the largest and most powerful East Slavic state in medieval Europe.

Monographien des RGZM, Band 92  
268 S. mit 270 meist farbigen Abb.  
ISBN 978-3-88467-172-6 (RGZM)  
76,- €

Aleksandr I. Ajbabin

### Archäologie und Geschichte der Krim im Frühmittelalter



Obwohl die Archäologie und Geschichte der byzantinischen Krim ein gut untersuchtes Thema ist, wurden die Forschungsergebnisse jenseits des russischen Sprachraums nur schwach rezipiert.

Die hier vorgelegte Monographie des international renommierten Archäologen Aleksandr I. Ajbabin, die aus einem gemeinsamen Projekt des RGZM und der Ukrainischen Akademie der Wissenschaften hervorgegangen ist, soll dabei helfen, diesen wesentlich vom Spannungsverhältnis von Steppenvölkern und Byzantinischem Reich geprägten Raum neu und verstärkt wahrzunehmen.

Die gründlich überarbeitete und erweiterte Übersetzung des erstmals 1999 in russischer Sprache erschienenen Werkes präsentiert dem deutschen Publikum eine umfassende Übersicht über das teilweise schwer zugänglich publizierte Fundmaterial und seine Chronologie.

Monographien des RGZM, Band 98  
288 S. mit 89 Abb., 32 Taf.  
ISBN 978-3-88467-188-7 (RGZM)  
72,- €

Verlag des Römisch-Germanischen Zentralmuseums, Mainz

Ernst-Ludwig-Platz 2 · 55116 Mainz · Tel.: 0 61 31/91 24-0 · Fax: 0 61 31/91 24-199  
E-Mail: verlag@rgzm.de · Internet: www.rgzm.de · www.shop.rgzm.de