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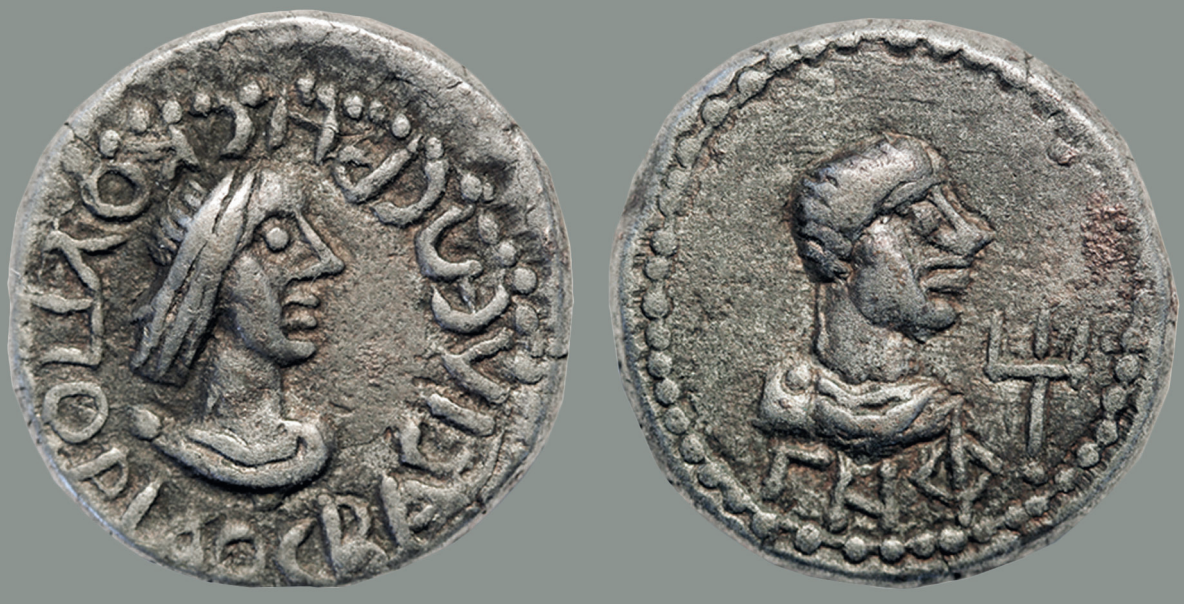

PEETERS

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SERIES EDITOR'S INTRODUCTION

I am very pleased to be able to publish yet another numismatic volume with a Black Sea flavour, the third, following volumes 32 and 34 in this series. It goes some way to fulfilling my plea in the first of those volumes for the better integration of numismatics into the mainstream (of ancient history and classical archaeology), in this instance through the application of scientific practices. Once again, Mikhail Abramzon is one of the authors.

Prof. Abramzon is Russia's foremost classical numismatist, author of many books and articles. He has participated in excavations for many years, especially at Phanagoria. Currently, he is Leading Research Fellow of the Department of Classical Archaeology, Institute of Archaeology, Russian Academy of Sciences, Moscow, and Director of the Research Institute for Historical Anthropology and Philology, Nosov Magnitogorsk State Technical University.

Yuliya Efimova is Assistant Professor and Senior Research Fellow of the Centre of Collective Usage, Research Institute 'Nano-steel', Nosov Magnitogorsk State Technical University, the author of a book and articles on the archaeometry (Bosporan 3rd-century staters).

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Irina Saprykina is a Research Fellow of the Department of Archaeological Heritage Preservation, Institute of Archaeology, Russian Academy of Sciences, a leading Russian archaeometrist, the author of many books and articles on archaeometry and natural scientific studies in archaeological metal (ancient jewellery, Roman and Greek coins.)

Tatyana Smekalova was a visiting Professor at the Centre for Black Sea Research, Aarhus University, a Senior Research Fellow of the Crimean Branch of the Institute of Archaeology, Russian Academy of Sciences, and Head of the Department of Natural Science Methods in the Archaeology of the Crimea, V.I. Vernadsky Crimean Federal University. She is one of founders of the archaeometrical studies of Bosporan and Pontic coins in Russia, author of many books and articles on coinage alloys in the Pontic region. She has worked on many archaeological expeditions in Egypt, Syria, Greece, Germany, Sweden, Turkey, Norway and Denmark.

As usual, my thanks to our publisher, Peeters, and especially to Bert Verrept, for the skilled handling of this volume, and to James Hargrave for second-reading the submitted text.

Gocha R. Tsetskhladze
Series Editor

AUTHORS' PREFACE

This project was implemented in 2016–21. It had its origins in a study undertaken by one of the authors, Tatyana Smekalova, in the early 2000s, the results of which were subsequently published as her doctoral thesis and in a monograph (Smekalova 2001; Smekalova and Dyukov 2001). To some extent, our new project was inspired by the grandiose project of Kevin Butcher and Matthew Ponting, *The Metallurgy of Roman Silver Coinage* (Butcher and Ponting 2014). The goal of the present volume is to sum up the results of metallurgical studies of 3rd-century AD Bosporan silver coinage. The critical debasement of the chief Bosporan denomination, the gold/electrum stater, occurred in the period from Rhescuporis III (AD 211/2–228/9) to Cotys III (AD 227/8–233/4), when the stater rapidly lost its gold content and became a silver and then a billon coin, and, further on, a copper one containing only small portion of silver. In order to impart nominal value with the quality of 'silver money' to these debased coins, different techniques of silver surface enrichment, from depletion silvering to silver plating, were applied. While the body of data demonstrating the effectiveness with which the Bosporan state, as well as the Roman state, disguised the adjustments to the silver content of their coinage continues to grow, one of the main tasks of the volume is an attempt at defining the possible techniques of silvering the Bosporan staters and comparing them with the synchronous silver coinage of the Roman empire where the same crisis was observable – the disintegration of the monetary system, inflation, debasement of coins (mainly of silver), hoarding, resulting from the operation of so-called Gresham's Law, and silver surface enrichment of coins with a copper core.

Within the 3rd-century historical background, the study of Bosporan coin-production is of special interest. The turbulent events in the northern Black Sea region called forth by the raids of German and Sarmato-Alanian tribes, accompanied by devastation of Bosporan settlements and aggravation of the economic condition of the state, led to a progressive debasement of the stater which, during an extremely brief time span, was transformed from gold/electrum coin to a silver one, then into billon and, finally, by the end of the century, into a purely copper coin. A fresh impulse for the studying this catastrophic process was induced by the discovery of a significant hoard of staters of Cotys III and Sauromates III at the Volna 1 Settlement (Taman Peninsula) in 2014. This assemblage contains electrum and silver staters struck with the same die combinations.

Another very important base for studying the metallurgy of Bosporan silver coinage is the huge Phanagorian 2011 hoard containing 3695 staters of the 3rd and early 4th century AD, of which over 2300 coins were struck from silver-copper alloys. This large and homogeneous assemblage of silver, billon and silvered copper staters reflects most vividly the process of the official debasement of silver coinage induced, on the one hand, by that of the Roman currency and, on the other, by the shortage of silver for the Panticapaean mint occasioned by the increasing military outlay to counter the growing pressure of nomadic tribes upon the frontiers of the Roman empire and the Bosporus, as well as by supply problems of metals in the Bosporan kingdom. The result was a progressive decline in the silver content of the coinage alloy and, after the almost complete disappearance of silver, the transition to silvering the surface of copper coins ensued. This is why the Phanagorian 2011 hoard provides precious evidence on the Bosporan economy, monetary history, and on the historical background of the period under consideration.

Studying of the coins of the Phanagorian 2011 hoard during the last six years has been conducted with application of a wide spectrum of scientific techniques in numismatics/archaeological metallurgy: XRF analysis, electron microprobe analysis (EPMA), focused scanning electron microscopy (FIB–FESEM–EDX; SEM–EDX), metallography, neutron resonance analysis in radiation capture (NRCA), neutron tomographic analysis diffraction, MC–ICP–MS lead isotope

analysis, etc. The recent studies, of which the results are summarised in the present volume, allow us to form a more comprehensive idea about the metallurgy of the last Bosporan 'silver', including the silvering techniques applied at the Bosporan mint.

An important landmark in the expansion of the metallurgical studies of Bosporan coinage was presented by the Russian Science Foundation project no. 18-18-00193 'The initial period of the history of money: transition from full-weight coin to token money' (2018–20) and its continuation, project no. 18-18-00193-P (2021–22). The microchemical and metallurgical examinations of staters of the hoards from Kerch (1964 and 1988), Anapa (1987), Phanagoria (2011) and the Settlement of Volna 1 (2014) were carried out in co-operation between the Institute of Archaeology, Russian Academy of Sciences (RAS), and many scientific institutions including the Restoration Laboratory of the State Historical and Archaeological Museum-Preserve 'Phanagoria', the Institute of the Geology of Ore Deposits, Petrography and Geochemistry, RAS, the A.N. Severtsov Institute of the Problems of Ecology and Evolution, RAS, the Research Centre of the History and Archaeology of the Crimea of the V.I. Vernadsky Crimean Federal University, the Centre of Collective Usage of the Research Institute 'Nano-steel' of the Nosov Magnitogorsk State Technical University, the I.M. Frank Laboratory of Neutron Physics of the United Institute of Nuclear Research, the State Research Institute for Restoration, etc. It is of note that all earlier investigations of Bosporan staters were limited to only small samples, whereas the lead isotope analysis of Bosporan coins now has been realised for the first time.

We are grateful to our colleagues and co-authors: Dr N.V. Bazhazhina (Simbirtseva), Mrs O.L. Gunchina, Dr S.E. Kichanov, Dr A.M. Yergashov, Dr S.T. Mazhen, Dr Y.D. Mareev, Dr D.P. Kozlenko, Dr K. Nazarov, Dr L.A. Pelgunova, Dr I.G. Ravich, Dr P.V. Sedyshov, Dr A.V. Chugaev and Dr V.N. Shvetsov, as well as to many other experts from the institutions enumerated, for their co-operation in studying the technological aspects of the Bosporan coin-production with the application of scientific methods in archaeology.

We would especially like to thank Prof. Vladimir Kuznetsov, the Director of the State Historical and Archaeological Museum-Preserve 'Phanagoria', the Head of the Department of Classical Archaeology of the Institute of Archaeology, RAS, and the director of excavations at Phanagoria, for his initiative and organisation of the interdisciplinary investigation of the Phanagorian 2011 hoard staters. Also, we heartily thank Dr Sergey Bezuglov, the director of excavations at Volna 1, as well as the keepers and curators of museums, Mrs Elmira Ustaeva (Taman Archaeological Museum), Dr Andrey Novichikhin (Anapa Archaeological Museum) and Dr Natalya Bykovskaya (Kerch Museum), for kindly allowing us to investigate hoards in their custody and for their help in organising large-scale XRF studies.

Publication of this volume would never be possible without invaluable help of Prof. Gocha Tsetskhladze. We are grateful to our dear colleague and friend for checking the whole text and publishing this volume in his *Colloquia Antiqua* series, and hope that our collaboration will continue.

Mikhail Abramzon
Yuliya Efimova
Natalya Koptseva
Irina Saprykina
Tatyana Smekalova

December 2021

LIST OF ABBREVIATIONS

CH XI	M.G. Abramzon and V.D. Kuznetsov, *Greek Hoards: The Cimmerian Bosporus* (Coin Hoards XI; Colloquia Antiqua 32) (Leuven/Paris/Bristol, CT 2021).
CIRB	V.V. Struve (ed.), *Korpus bosporskikh nadpisei/Corpus inscriptionum regni Bosporani* (Moscow/Leningrad 1965).
JSI	*Journal of Surface Investigation: X-ray, Synchrotron and Neutron Techniques*.
MAIET	*Materialy po Arkheologii, Istorii i Etnografii Tavrii*.
PIFK	*Problemy istorii, filologii, kul'tury*.
RIC	C.H.V. Sutherland *et al*., *Roman Imperial Coinage*, vols. I–X (London 1984–94).
RPC Cons. Suppl.	P.P. Ripollès, A. Burnett, M. Amandry, I. Carradice, M. Spoerri Butcher, *Roman Provincial Coinage Consolidated. Supplement* I–III (1992–2015) (*http://rpc.ashmus.ox.ac.uk/supp/rpc_cons_supp_1-3.pdf*).
RPC Suppl. 3	M. Amandry, A. Burnett, I. Carradice, P.P. Ripollès, M. Spoerri Butcher, *Roman Provincial Coinage. Supplement* 3 (New York 2014).
VDI	*Vestnik Drevnei Istorii*.

LIST OF ILUSTRATIONS