R E V I E W

of Totko Stoyanov, PhD, Professor at the Department of Archaeology of Faculty of History

on the habilitation thesis of Boyka Kuncheva Zlateva, based on archaeometric analysis of metals - belt accessories and coin treasures from different epochs reflected in 5 publications in the competition for associate professor in the professional field 4.2. Chemical sciences (Analytical chemistry - Archaeometry),

On the basis of Article 4 of the Law on the Development of Academic Staff in the Republic of Bulgaria and a competition announced in Official Gazette No. 100 of 16.12.2022 for the post of half-time associate professor in the professional field 4.2. Chemical Sciences (Analytical Chemistry - Archaeometry).

In the announced competition for associate professor in the professional field 4.2. Chemical Sciences (Analytical Chemistry - Archaeometry), only one candidate submitted documents - Head Assist. Boyka Zlateva, PhD, lecturer at the Faculty of Physics, Sofia University "St. Kl. Ohridski", Department of Analytical Chemistry, as well as a researcher at the Center of Archaeometry with the Laboratory of Conservation and Restoration at Sofia University "St. Kl. Ohridski"

The candidate is co-author of 44 scientific publications (up to the time of submission of the documents), and for the academic position of Associate Professor she is involved in 18 publications, most of them devoted to archaeometric analyses of archaeological finds of different type and time range.

In terms of the scientific-metric data (group A 50 pts., group B 110 pts., group D 244 pts., group E 230 pts., group G 180 pts., the last indicator being part of the additional requirements of the Faculty of Chemistry and Pharmacy) the candidate meets and exceeds the minimum requirements of the Academic Staff Development Act in the Republic of Bulgaria (ASDA) for acquiring the academic position of Associate Professor at the Faculty of Chemistry and Pharmacy at Sofia University "St. Kl. Ohridski".

Boyka Zlateva has completed her secondary education at the OTHPB "Prof. Dr. Asen Zlatarov", Sofia. She completed her higher education in 1992-1997 at the Faculty of Chemistry (now the Faculty of Chemistry and Pharmacy), majoring in Chemistry, (Organic and Analytical Chemistry) with the defense of her diploma thesis.

During the period 1998-2001 she was a regular PhD student at the Department of Analytical Chemistry, In 2003 she received the scientific and educational degree "Doctor" with a defense before the appropriate specialized committee at the SAC.

With the exception of the period 1997-1998 and 2002-2003, when she held the positions of "Chief Expert" at the National Soil Service and "Chemist" at the INRIE-BAS, the candidate's work experience is in the Department of Analytical Chemistry, Faculty of Chemistry and Pharmacy at the Sofia University. Kliment Ohridski" (since 2019 also at the Center of Archaeometry with the Laboratory of Conservation and Restoration, Faculty of History, Sofia University "St. Kliment Ohridski").

The main activities and responsibilities of the candidate include teaching - lectures and exercises in Analytical Chemistry, Instrumental Methods of Analysis, Archaeological Chemistry, lecture course in Archaeometry in the Master's Program of Archaeology at the Faculty of History, Sofia University "St. Kli Kliment Ohridski". He is also a supervisor of theses.

Boyka Zlateva has participated in more than 60 international and national scientific forums, has been a leader of projects funded by the Fund for Scientific Research at Sofia University (2) and at the National Scientific Research Fund (1), participant in 27 scientific projects.

The habilitation thesis comprises five publications (1, 2, 4, 7, 42) devoted to archaeometric analysis of archaeological objects based on metal alloys. Two of the papers reflect analyses of belt accessories from Late Antiquity and three of coins from three different periods.

There are 15 articles outside the habilitation thesis (8, 9, 12-19, 43, 44), also mostly dealing with archaeometric analyses - organic residues, pigments, glass and metal finds, etc., with articles 8 and 23 dealing with some ecological aspects.

Boyka Zlateva's scientific contributions are in the field of Instrumental Methods of Analysis, as specific techniques for the analysis of archaeological artifacts or objects of cultural heritage.

Archaeometric research can be divided by the type of artefacts analysed as follows:

I. Metal and metal alloys (articles 1, 2, 4, 7, 18, 42);

II. Glass, mosaics, mortar (articles 13, 15, 16, 19, 43);

III. Organic residues (Articles 9, 12, 17, 44);

A wide range of analytical techniques have been used, such as ICP-AES, ICP-MS, XRF, HPLC, 1H-NMR, 13C-NMR, which are specifically aimed at the analysis of archaeological artefacts.

It should be noted that the analysis of archaeological artefacts often involves requirements for minimal impact on the finds, which largely limits the methods used and is a logical prerequisite for the use of X-ray fluorescence spectrometry in many cases.

I. Metal and metal alloys

- Cu and copper alloys,

Included in the articles numbered 1 and 7, which cover studies of belt accessories (buckles, clasps, appliqués, accompanying metal artifacts, etc.) dating from the time of the Migration of the Peoples (3rd-7th centuries AD).

A total of 219 artefacts originating from the entire territory of modern Bulgaria were analysed, and information on their chemical composition was obtained and processed statistically. The archaeometric interpretation of the obtained results is correct, giving technological features in the manufacture of the articles, regional, temporal, gender and ethnic characteristics.

Against the background of the large number of studies related to coins/coin hoards in the worldwide, the archaeometric analyses on this topic in Bulgaria have started only in the last few years and this beginning has been made by Head Assist. Dr. Boyka Zlateva.

- Electron, silver, gold used for coinage (articles 2, 4, 18, 42)

They cover the analyses of a total of 171 coins dated in different eras (6-4th centuries BC and the Roman era), and the corresponding numismatic expertise is also provided. In addition to the elemental composition of the coins determined by p-XRF after appropriate minimal sample preparation, distributions by time, coin type, technological features, and possible sources of raw materials are given, and the data are treated statistically.

Glass, mosaics, mortar

Articles concerning chemically inhomogeneous materials, namely glass, mosaics, mortar, are united;

- Glass and mosaics - articles 16, 19 and 43 deal with glass from the Hellenistic and pre-Roman periods, as well as medieval finds, found on the territory of modern Bulgaria as well.

Taken together, the results show that, regardless of the period, sodium-calcium-silica glass was used, potassium glass is virtually absent, and the source of the flux is: 'natron' type, 'vegetable origin, ash' and 'mixed natron-plant ash', and a combination of Mn/Sb was used for colouring/de-colouring.

II. Organic residues

- Organic remains of wine in ancient transport amphorae - items 17, 44 (cf. also Nos 38-39 of the general list).

In the Mediterranean in Antiquity, trade in clay containers (amphorae) of standard shapes and volumes, in which large quantities of wine, olive oil and other bulk commodities (foodstuffs) were transported, became of prime importance for economic development. As a result of advances in amphorology, the question of the objective study of transported substances is becoming increasingly important, which has led to the growth of the archaeometric studies needed for this purpose and their increase in scope and progress in the analytical methods used. In Bulgaria, such studies have only begun in the last fifteen years.

The publications pointed above present analyses conducted using a range of state-of-the-art methods by B. Zlateva (et al.), which were used to define the remains of pine resin (Pinus Halepsensis) in amphorae and amphora fragments found during excavations in the area of Sozopol (Apollonia Ant.), Chernomorets and the Sboryanovo reserve near Isperih. The comparison with samples of modern resin confirmed the assumption of the transportation in these vessels of wine, type "Retzina", for the production of which this resin was used - a well-known technology from antiquity, used still today in Greece. The different types of amphorae and their chronology are objective evidence of the trade with production centres from Aegean.

The accumulation of data and experience is a prerequisite for further successful steps of archaeometry in Bulgaria in this important field of the archaeology of Antiquity.

- organic components of mural layers in Thracian tombs (article 12)

The documentation of the use of beeswax with certain characteristics to shape the polished surface in the 'Pompeian red' area in the wall paintings of one of the most representative Thracian tombs, that at Alexandrovo, Haskovo, is a contribution to the study of decorative techniques applied to this and other Thracian tombs with pictorial decoration.

- Organic remains of habitation in residential and farm complexes (article 9)

This publication presents the results of a pioneering study using the method of so-called phosphate analysis of an ancient settlement in the area of Chirpan, after a phase of archaeological survey that outlined the main elements of its structure. The results show buildings and structures with a high concentration of phosphates, which, in combination with the archaeological material, define different forms of domestic or staple activity; they also identify areas with a lower concentration or lack thereof, leading to a concretization of their interpretation. With a good knowledge of the methodology, the application of this method can give good results, but it is, unfortunately, still out of sight of the majority of Bulgarian archaeologists.

I have known Boyka Zlateva since the time when she was a PhD student and I have witnessed her professional development. I have personal impressions from my work with prof. Ivelin Kulev’s team and directly related to her appeal as a lecturer in Archaeometry in the Department of Archaeology of the Faculty in Histroy and a researcher at the Centre of Archaeometry with the Laboratory of Conservation and Restoration at Sofia University. Kliment Ohridski". In the last five years we have worked together on the preparation and implementation of a significant project for Thracian archaeology, funded by the National Scientific Research Fund, which was successfully completed at the end of 2022 with important results of archaeometric research, made for the first time in Bulgaria, with significance for the studied problems in ancient archaeology in general. For me, she is an established, quality researcher and teacher, a responsible and loyal colleague.

In conclusion, and as a consequence of the above, confirming the above pointed qualities of the candidate as a formed thorough researcher in the field of archaeometry for the needs of archaeology, I declare to the esteemed scientific jury my confidence to vote positively for the award of Head Assist. Dr. **Boyka Kuncheva Zlateva** to the academic position of **Associate Professor**.

10.04.2022 Totko Stoyanov