STANDPOINT

on competition for associate professor
in 4.2. Chemical Sciences (Analytical chemistry-Archeometry)
announced in SG No. 100 , 16.12.2023
with candidate Dr. Boyka Kuncheva Zlateva

by Prof. Dr. Tony Georgiev Spassov
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In the competition for Associate Professor in Analytical Chemistry - Archaeometry at the Faculty of Chemistry and Pharmacy of Sofia University participated one candidate - Dr. Boyka Kuncheva Zlateva. Dr. Boyka Zlateva graduated from the Faculty of Chemistry, Sofia University. In 2001 she defended her dissertation for obtaining the scientific and educational degree of Doctor at the Faculty of Chemistry, Department of Analytical Chemistry.

Boyka Zlateva worked at the Department of Analytical Chemistry, Faculty of Chemistry, Sofia University as a chemist, assistant professor, senior assistant professor (2002 - 2006), and since 2006 she has been a senior assistant professor. Currently, she works half-time at the Faculty of Chemistry and pharmacy as a Principal Assistant Professor and half-time at the Faculty of History (since 2019) of the University of Sofia as an established R2 researcher.

The scientific activity of Dr. Boyka Zlateva covers 44 publications, 15 of which are indexed in Scopus. She participated in the competition with 18 publications; five of the publications are included in a habilitation thesis (two - in Q1, 1 - in Q2, 1 - in Q3 and one book chapter); the remaining 11 are in journals, two - in book chapters. One of the publications is in Q1, five in Q2, three in Q3 and two in Q4. A total of 75 citations have been noted on Boyka Zlateva's work, (h index - 5), 55 of the citations are on publications included in this competition. Archeometric analysis of metals used for making coin treasures in Bulgaria (Archaic Age, Classical Roman Age) and belt accessories (Late Antiquity).

Dr. Zlateva has participated in 27 research projects and has submitted five projects for the competition. She is the supervisor of four graduate students.

The teaching activity of Dr. Boyka Zlateva covers courses at the Department of Analytical Chemistry of FHF, Archaeometry for MSc, Archaeology.

Dr. Zlateva's scientific research is focused on the field of Archaeometry and more specifically on the use of modern instrumental methods for the analysis of archaeological artefacts and objects of our cultural heritage. The palette of objects of study is rich - metals and alloys as well as ceramic materials and glasses have been analyzed, all by using a professional

approach involving sample preparation, instrumental analysis, statistical processing and interpretation, and publication of results containing novelty and scientific contribution.

Without going into details on Zlateva's achievements on each group of studied objects (grouped by the author in his statement of contributions), I will present only those that, in my opinion, are more significant and also give a very good idea of the scientific contributions of the candidate. A series of publications (1,1,4,7,18,42) is devoted to metal artefacts of copper, silver, gold and some of their alloys. Thanks to precise analysis carried out with appropriate modern equipment (ICP-AES, ICP-MS, p-XRF), regional features of the finds, the technology of their manufacture and other characteristics have been established. The analysis of coins of gold-silver alloys (combined with numismatic expertise) has allowed the determination of the authenticity of the coins. The study on silver alloy coins has led to a classification by time (years of reign of Roman emperors) and has also allowed locating possible ore deposits. In work No.18, the chemical composition of a Thracian gold wreath from S. Kabile (4th century BC) was analyzed and shown that it was made of a gold alloy with a very high gold content (97-99.9%). With the help of precise chemical analysis it was also found that the gold used for these artefacts came from four different sources, the geographical location of which is difficult to identify due to the lack of analytical data on the concentrations of the platinum group elements from the different gold deposits in Bulgaria. In this regard, the analytical data obtained from Zlateva are a good basis for future research.

In another group of publications (№ 13,15,16,19,43) Dr. Zlateva analyzed chemically complex multicomponent and multiphase materials - glass, mosaics, mortar, materials of importance for the development of mankind. Furthermore, it was found that the literature lacks data on the elemental composition of mosaic glasses in Bulgaria. In this regard, the results of Zlateva lead to significant conclusions. Such are, for example, the data that sodium-calcium-silica glasses were used in our lands; that the flux used was vegetable ash or "natron", and that Mn/Sb as well as a combination of Cu/Co were used as colorants. In addition, a number of characteristics of mortar used in our territory from the middle of the Iron Age to the Middle Ages have been evaluated, and different recipes for its preparation have been identified.

The phosphate content of soils was also analyzed, allowing the delineation of areas of human activity and the boundaries of ancient settlements. In another work by Dr. Zlateva, samples of decorative plasters in Thracian tombs were examined to determine technological features in their manufacture. To achieve this, spectroscopic (ATR-FTIR, XRF), thermal (DSC) and diffraction (XRD) methods were applied, and significant information was obtained on the use of sophisticated painting techniques.

The applicant has also submitted two environmentally oriented papers in which the toxic effect of the herbicide Roundup was investigated. The transfer of ^{137}Cs from the soil to the plant was determined. A strong inhibitory effect was found in barley leaves and roots after Roundup application. Radionuclide transfer coefficients were also determined.

The candidate's habilitation thesis is based on 5 thematically unified publications and is characterized by the adopted structure of such a thesis, namely, the introductory part presents the scientific achievements in the field and formulates the need for new research, as well as the purpose of the study conducted by the author. In the part devoted to scientific results and contributions, the candidate has presented the achievements on the archeometric analysis of metal belt accessories and coin hoards from different eras. More than 200 metal finds have been analyzed and significant information for archaeology has been obtained.

The results of the analyses of the alloys used for the manufacture of belt accessories are summarized in several conclusions, the more significant of which are:

- it was found that almost pure copper was most commonly used for belts, and that semi-red (copper-rich) brass was used only for the manufacture of belt fittings,

- specimens of brass alloys outnumbered those of bronze alloys by a factor of two,

- the use of different copper alloys has been shown to be related to place of manufacture rather than chronological period. More importantly, what raw materials were available to ancient craftsmen, how they remelted older bronze or brass artefacts. For example, higher amounts of lead in copper alloy improved the casting process and was added to almost all alloys as cheaper than copper, tin and zinc. Therefore, either older artefacts were remelted or more lead was used instead of copper, tin, or zinc.

Coin analyses are divided into two main groups. The first is related to the beginning of coinage and concerns a significant number of electronic coins from Asia Minor. Because of the considerable interest in this topic, leading institutions such as the American Numismatic Society, the Bibliothèque Nationale in Paris, the Ernest Bablon Research Center in Orléans, and the Field Museum in Chicago are involved in the research. The aim is to refine chemical analyses and build databases. The candidate's contributions to these studies are indisputable and can be summarized as follows: no manipulation of metal purity has been found for the coin cores in Balkan Thrace. In the case of the electron coins, however, the extraction was by leaching material from the rivers. The financial policy of the various kingdoms necessitated manipulation of the purity of gold according to each particular case and period. With this first-of-its-kind study, a sufficient amount of information has been gathered, subject to further processing.

The second group of coins studied is from the Roman era. By using instrumental analyses such as XRF, SEM, X-ray tomography new and important information about the coin treasures from Bulgaria was obtained. The chemical analysis of Roman silver coins found in hoards from the 2nd-3rd centuries AD shows that copper is the main impurity in the silver alloy. The copper content varies between 10% and 70%, which corresponds well to the historical and economic conditions of the time period under consideration. The coins are shown to be an important and reliable historical source when supported and synchronized with other sources, both written and archaeological.

In conclusion, taking into account the volume of the scientific research carried out by the candidate and the presence of undeniable contributions, combined with many years of active teaching, I propose Dr. Boyka Zlateva to be elected as Associate Professor of Analytical Chemistry at the Faculty of Chemistry and Pharmacy, Sofia University "St. Kliment Ohridski".

10.04.2023

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