



## The Archaeomineralogy – independent interdisciplinary direction in the archaeometry and the Bulgarian science

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**Key words:** archaeometry, archaeomineralogy, archaeometallurgy, artifacts

In the contemporary conditions of scientific progress, the development of the different sciences depends not only on their internal self-organization but also on the general level of human knowledge. Each science is developed most intensively in the border areas with other mutually related sciences and is stimulated by the common interdisciplinary studies. As a result from this approach, relatively young sciences like the archaeology quickly marked serious progress in its development and achievements. In the specific case the archaeometric measurements which unify interdisciplinary directions in almost all areas of human knowledge have significant contribution to this dynamics. The mineralogical studies (in the current paper the author takes into consideration only the ore mineralizations) have limited role and significance in the archaeometallurgical interpretations. This leads to favour the metallurgical aspects of the problem and underestimating the rest. In numerous cases the mineralogical results received in such conditions of studies are limited in volume and information. This should be exactly the opposite because the mineralogical data and objects are the basis on which the next interdisciplinary measurements for the archeological interpretations are done. The present paper resumes the experience and the views of the author regarding the place and the role of mineralogical studies for the needs of archaeology in our country and does not pretend to be comprehensive for the problem. The main objective of this work is to set the beginning of a discussion among the geological society in Bulgaria for the problems related to this type of studies and the necessity of separating them from the archaeometallurgical direction, also their independent establishment in the archaeometry and the Bulgarian science.

The first native pieces of gold, silver and copper accidentally found by people on the earth surface set the beginning of the extraction and usage process of the minerals. This process determines one of the most important steps in history of human society

and becomes a turning point in its development. Mining and metallurgy in the ancient times have been extremely important for the living and the culture of local people who occupied today's Bulgarian lands. During the Antique period the Thracians have even become synonymous for good and experienced ore-miners. Relatively detailed information for the rich ore deposits which they have exploited is preserved to present days thanks to the interest of the Antique writers to them (Велков, 1972; Панайотов, Йорданов, 1975). The Antique authors give the first records for the minerals in our lands marking that the interest to the Thracian territories rich of gold, silver and copper has never stopped during the whole Antique epoch. The Bessi, one of the most numerous tribes forming the Thracian ethnos have been popular as good ore-miners. They have been hired for the siege of fortresses to mine under the walls galleries, called *cuniculi more Bessorum* (= galleries in the fashion of the Bessi) with the aim to get easier inside and capture the fortresses (Коняров, 1953; Bachmann, Tsintsov, 2003).

In present days geologists and mining specialists have significant contribution for extending our knowledge on the ancient ore-mining and metallurgy on the Bulgarian lands. During their terrain works they constantly find and publish new data for traces of ore-mining and metallurgy in number of deposits. The contemporary approach of mineralogical studies in these deposits (with traces of ancient ore-mining) does not presume archaeometric definitions of the separate phase components forming the ores in them. In the last few decades contemporary archaeometric measurements were conducted within international projects and with outside finance on different copper artifacts and ores from Bulgarian deposits which had indications for exploitation in the ancient times (Gale et al., 2000). Archaeometric measurements on ores and artifacts of the other metals are extremely limited and insufficient. In this respect a good example are the gold artifacts from

Varna Necropolis presented in many countries as “the oldest gold in the world processed by people”. The chemical analyses of artifacts from the Necropolis show that they contain minimum quantity impurity of platinum (Hartmann, 1978). These data and the limited chemical analyses of native gold from Bulgarian deposits in that time gave grounds to the quoted author to conclude that the natural source of gold for the artifacts is outside the boundaries of today’s Bulgaria. Later the reliability of this statement was questioned seriously on the grounds of indirect (Weisgerber, Pernicka, 1995) and direct analytical (Tsintsov, 2000; Bachmann, Tsintsov, 2003) evidences. Nevertheless the question with the source of gold for the artifacts from Varna Necropolis is still of interest and speculations are done based on the subjective views of their authors, not on analytical data. Unfortunately these speculations do not take into consideration the fact that there are numerous deposits with traces of ancient gold extraction on the territory of Bulgaria and each one of them might be a source. The lack of archaeometric data for native gold in Bulgaria is explained with different reasons. According to some authors the placers of gold are not subject to accurate localization (Тодорова, Попов, 1994), while others claim that the Bulgarian governments still lead a restrictive informational policy in this direction (Lehrberger, 1995).

The limited archaeometric studies on the metal raw materials in Bulgaria from one hand, and the sensational findings of our archeologists in the last decades which increased the interest of the international research teams from the other, are in complete discordance to each other. This is not in line with the present directions and dynamics of the archaeology (resp. archaeometry) development and the related scientific interpretations. In that respect the view of the author of the present paper is that the development of the archeomineralogy as a separate interdisciplinary direction in archaeometry might support the overcoming of this discordance. More, as independent sciences the geology (in particular mineralogy) and the archaeology in Bulgaria had enough interface in the last century showing that the interdisciplinary cooperation between them is close and useful for both.

At the beginning of 1990’s the possibilities of the “schlich-archeological” analysis for searching ancient mining-metallurgy gold complexes on the grounds of data for the gold artifacts collected during mineralogical researches of alluvial sediments in Bulgaria were shown (Tsintsov, 1992; Цинцов, 1993). The author’s assumptions for the wide development of gold extraction and processing activities on the Bulgarian lands in the archaeological periods BC were proved with the finding of gold artifacts from the mounds close to Dubene village, Karlovo region (Tsintsov, 2005). In addition during the archaeological study of these mounds the “schlich-

archaeological” analysis was used for localization and collection of the extremely small gold artifacts, the total number of which exceeded 15 thousand. Significant part of them are analogous in form and size with the gold artifacts from the alluvial placers in Bulgaria. Besides, part of the objects have similar morphological features with the gold artifacts from Troya. It is known that Troya had trade relations with the people living at the north of its boundaries. From these facts a lot of questions arise but the main in the particular case is “What was the direction of gold and gold objects in the ancient times — from Thracian lands to Troya or the opposite?”. This is a serious challenge to the possibilities of today’s science as a whole. Knowing the impressive heritage of gold extraction material records left from the ancient gold-miners in the placers of our lands, the author of the present paper unreservedly supports the first hypothesis. However the proof of each of them requires analytical data, i.e. a basis of archaeometric measurements of native gold from different deposits in Bulgaria to be used for comparison with similar data from the artifacts.

Mineralogical studies during archaeometallurgical researches in the area of Vulche pole village (Ljubimets region) proved that the development of iron metallurgy in the late Bronze, Iron and Rome ages (chronological frame XVI century BC — VI century AD) in the region was based on the processing of placer magnetite-hematite mineralizations (pieces with size up to 25 cm) being contained in big quantities in the alluvial sediments of some rivers (Цинцов и др., 2006). As a result from these studies the location of the ancient mine was determined. Besides, part of the pieces (predominantly hematite) are appropriate for pigments and probably they were used for the production of colorants in the ancient times. It is necessary to mark that before the mineralogical studies in the region these pieces were popular among the local people as “mercury stones”, and others considered them as waste slag from ancient metallurgical activity. Archaeometric data for these mineralizations would also help to follow the trade relations of the local people in the past by clarifying the route of the raw materials and the products from them.

The above examples show the potential of the mineralogical studies to support the archaeological researches in our country. In this aspect better effectiveness is possible only by establishing archaeomineralogy as a separate scientific direction in the wide scope of archaeometric studies and the Bulgarian science. Thus, there will be conditions for allocating bigger resources and conducting of profound purposive studies of the ores. In this way the main objectives of the archaeomineralogy will be realized, namely: localization of the mineral raw materials (ore) within the boundaries of an appointed ancient ore deposit (occurrence) and accumulation of archaeometric data allowing comparisons with analogical ones from metal artifacts to deter-

mine the source of the raw materials. To achieve these objectives it is necessary to develop methodological instructions for sampling this type of ores and define the borders of variation for the different coefficients of the useful components in the frames of the ancient mine. Thus, an archaeometric database will be developed of the mineral raw materials used in the ancient times for metal extraction on the Bulgarian lands. The experience up to now shows that “schlich-archaeological” analysis is very informational in this type of studies and it is expedient to adapt it for the conditions of the archaeomineralogical studies. Besides, an educational course in archaeomineralogy is needed to introduce within a few school hours the characteristics of the mineral raw materials used in the ancient times for metal extraction, the indications for localization of ancient mines and the criteria for defining their boundaries, the possibilities of the “schlich-archaeological” analysis, etc. to the students in the master programs of

“Archaeometry” in Sofia University “St. Kliment Ohridski” and “Applied mineralogy” in University of mining and geology “St. Ivan Rilski”, also in other similar Universities. According to some researchers the archaeomineralogy should have different objectives and problems (Rapp, 2002) which the author of the present paper does not share.

The last few archaeological seasons in our country show that the necessity of archaeometric data is increased for the archaeological interpretations for the metal raw materials extracted in the ancient times on the Bulgarian lands. At this stage the Bulgarian mineralogical science has limited potential in that aspect and cannot answer adequately to these needs. The extension of the archaeometric database requires the organization of a certain mineralogical basis on which these studies will be developed and this is possible only through the methods of archaeomineralogy.

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# Археоминералогията — самостоятелно интердисциплинарно направление в археометрията и българската наука

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**Резюме.** В съвременните условия на научен подем и напредък, развитието на отделните науки зависи не само от вътрешната самоорганизация на всяка една от тях, но и от общото ниво на човешко познание. Всяка наука се развива най-интензивно в граничните области с други, взаимно свързани с нея науки и се стимулира от съвместните интердисциплинарни изследвания. Минераложките изследвания (в настоящата работа автора има предвид само рудните минерализации) за нуждите на археологията се отнасят към археометалургичните интерпретации където имат ограничена роля и значение. Това води до фаворизиране на металургичните аспекти на проблема и подценяване на останалите.

Последните няколко археологически сезона у нас показаха, че в близките години все повече ще нараства необходимостта от археометрични данни на металните суровини за нуждите на ар-

хеологическите интерпретации. На този етап българската минералогическа наука разполага с ограничен потенциал в това отношение и не може да отговори адекватно на тези нужди. Разширяването и обогатяването на базата от археометрични данни изисква изграждането на определена минераложка основа върху която да се развият тези изследвания, а такава е възможно да се създаде само чрез методите на археоминералогията. Предлаганата работа обобщава опита и вижданията на автора за мястото и ролята на минераложките изследвания за нуждите на археологията у нас като основната ѝ цел е да постави началото на една дискусия сред геоложката общност в България върху проблемите свързани с този тип изследвания и необходимостта от отделянето им от археометалургичното направление и обособяването им като самостоятелно такова в археометрията и българската наука.