which already contains the said metal in a certain percentage. Of tin), or, on the other hand, due to the exploitation of copper ore remelting (multiple remelting significantly reduces the content of tin), and from an unknown deposit in Macedonia.1

The authors conclude that a presence of this type of ore in the Iberian Peninsula is frequent, and that the ore was readily used in prehistory. The sites with metallurgy activities were recorded in the vicinity of the mine, which indicates that bronze was produced from the ore found in the vicinity.

Josip ŠARIĆ


In September 2001, at XIV UISPP Congress in Liège in Belgium, one of the most interesting Symposia of the Congress was held, according to the opinion of the author. The Symposium dealt with archaeometallurgy of tin – a metal so important for the development of civilization in the old part of world, and at the same time so rare in nature, that it is rightfully considered to be, in addition to gold and silver, the third precious metal. As a result of this conference, this book was published with the papers from the above mentioned Symposium. The book is divided into four basic parts, leading the reader gradually through archaeometallurgy issues related to tin in the prehistory of the Mediterranean Basin.

Part one, »Geology and Sedimentology«, treats the problem of the deposits of tin ore in the Mediterranean Basin in Bronze Age. An exceptional article, »Tin in the Mediterranean Area: History and Geology«, by authors R. Valera & P. Valera, in a straightforward manner explains the basic issues related to the study of this metal: its characteristics, deposits, behaviour in archaeological layers, etc. The authors point out the already well accepted view that the Mediterranean Basin is not rich in tin, and that if there happened to be any exploitation of tin in this part of the world, it would have been recorded in some manner. Therefore, in addition to the already known deposits and potential suppliers of tin like western Iberian Peninsula, Brittany, Cornwall, Erzgebirge, they raise the possibility of tin being procured from the mines in Afghanistan, then from a somewhat closer Turkey, and from an unknown deposit in Macedonia.1

The next text, »Natural Tin-Bronze Alloy in Iberian Peninsula: Metallurgy: Potentiality and Reality« by S. Rovira and I. Montero, deals with the problem of production of bronze with low content of tin, which may, on the one hand, the result of remelting (multiple remelting significantly reduces the content of tin), or, on the other hand, due to the exploitation of copper ore which already contains the said metal in a certain percentage.

Such ore was exploited in prehistory in the Iberian Peninsula, and the result of experimental melting was bronze with a low tin content (up to 2%). The authors conclude that a presence of this type of ore in the Iberian Peninsula is frequent, and that the ore was readily used in prehistory. The sites with metallurgy activities were recorded in the vicinity of the mine, which indicates that bronze was produced from the ore found in the vicinity.

J. Cierny & G. Weisgerber in the article »Bronze Age Tin Mines in Central Asia« present a theory that it was quite possible that tin was brought all the way from Central Asia, and that it travelled across the entire Mediterranean by trade routes. The paper mostly deals with deposits and prehistoric tin mines in Tajikistan and Uzbekistan. A mine which was fully exploited could approximately supply, according to the assessment of the authors, about 1 tonne of tin. The paper provides detailed descriptions of mines and technique of exploitation of tin ore applied by the members of Andronovo culture.

Part two of the book, entitled »Metallurgy and Metallography – Archaeometallurgy in Europe« deals with metallurgy and metallography of Bronze Age in the Mediterranean Basin. Six papers provide results of various exact analyses of bronze, undertaken with the aim of reconstructing the complete process of obtaining bronze, discovering all possible variations present in that process, which resulted in metallographic differences in final products.

Q. Wang and B. Ottaway, in the text »Casting and metallography of tin bronzes in clay moulds«, present the results of experimental casting of bronze with the aim of explaining metallographic differences in prehistoric bronze finds. The experiment involved the entire process, from making moulds to the final casting of a bronze axe. The total of 36 samples were cast out of 12 types of alloy and at three degrees of cooling, and the entire process was carried out in moulds with several degrees of prior heating. All this resulted in difference in...
metallographic analyses of cross-sections of experimentally produced items.

The next paper, entitled »The Etruscan tin: a preliminary contribution from researches at Monte Valerio and Baratti – Popolonia (Southern Tuscany, Italy)«, by authors M. Benvenuti, L. Chiarantini, L. Norfini, A. Casini, S. Guidieri and G. Tanelli, shows a highly interesting methodological approach in examining the possibilities of exploitation of tin ore in Tuscany. The text offers results of »geo-archaeological« recognition of the mine of Monte Valerio and the Etruscan metallurgical site of Baratti. The mine is thought to have been in use since antiquity, but the first records of its exploitation originate as late as 17th century. Based on that it was believed that the deposit may have been in use during late prehistory as well, so a detailed recognition of the mine area was undertaken to that aim, and all prehistoric sites and locations mentioned in historical records were entered. Unfortunately, all this failed to provide confirmation on Etruscan exploitation of the mine. Mineralogical analyses of samples from the mine and samples from the nearby metallurgy centre of Baratti similarly failed to provide confirmation of prehistoric exploitation of tin. Since analyses were few in number, the authors hope for positive results after further, more extensive research.

The article »Analyse élémentaire des dépôts Lorrains: essai de caractérisation d’une production métallique de la fin de l’Age du Bronze« by C. Veber, B. Mille and D. Bourgarit treats the problem of hoards from Late Bronze Age (9th–8th centuries B.C.) which were concentrated in the area of Lorraine in France, and which were discovered at the end of 19th and beginning of 20th centuries. The finds from these hoards present a typologically homogeneous group, which was confirmed by metal analyses as well.

The next paper, »L’étain dans les examens métallurgiques de quatre ensembles villanoviens. Premiers résultats« by A. Lehöerr, treats bronze objects from the graves of the Villanova culture. A certain number of these objects (30 in all – from Tarquinia Monterozzi, Veio Quattro Fontanili, from British and Ashmolean museums) were analyzed. It was established that a high level of bronze production technology was present, as well as that the objects originated from several workshops, recognizable by bronze production technology.

M. Primas in »The Use of Tin and Lead in Bronze Age Metallurgy« discusses in general the presence of tin and lead bronze in Europe and territorial borders of these two types. The author supports the Near East origin of bronze, believing that the technology of its production rapidly spread through Europe by all possible communication lines already existing in previous periods. In Late Bronze Age (from c. 1100 B.C.) lead began to be used in the production of an alloy used only for certain types of objects.

The text by A. Giumlia-Mair, »Iron Age Tin in the Oriental Alps«, presents results of metallurgical and chemical analyses of material from the sites of Misincinis, S. Lucia/Most na Soči, San Zeno, as well as from several sites in the area of Friuli, among which are Variano near Udine and Pozzuolo del Friuli. The differences in the content of tin and lead in bronze by sites and types of object were identified, which may serve to illustrate from where and by which route tin was brought into the Alp regions of Europe.

The third part of the book, »Archaeometallurgy on major Mediterranean islands: Cyprus, Sardinia, Sicily«, treats the Bronze Age archaeometallurgical finds and issues with regard to the three largest islands in the Mediterranean. All three islands, due to their dominant geographical position, held an important position in the circulation of tin during Bronze Age.

A highly interesting article, »The Trade of Tin and the Island of Copper«, by the author V. Kassianidou, offers a new opinion on the importance of Cyprus in the distribution of metal in the Mediterranean. Cyprus is one of the countries richest in copper, and the exploitation of copper on that island started probably back in early Bronze Age, although the earliest archaeological proof of that originates only from Middle Bronze Age (1900–1600 B.C.). Cyprus copper in the form of ingots was found from Bulgarian coasts to the Nile delta and from Haifa to Sardinia. Tin bronze appeared in the Late Bronze Age. Tin is not present in Cyprus, but tin ingots with Cyprus-Minoa marks were found in several locations in the eastern Mediterranean. By far the most important find comes from the sunken ship near Ulu Burum (modern Kas in Turkey). In the shipwreck a rich metallurgic load was found: c. 10 tonnes of copper in the form of 475 ingots, and almost 1 tonne of tin in ingots and slabs. The ingots had marks, some of which were recognized as Minoan script (Cypro-Minoan script), which were not cast in a workshop but inscribed at a later time. The author’s thesis is that the mentioned ship may have been Cyprian, and accordingly that Cyprus was the centre for distribution of copper and tin throughout the entire Mediterranean Basin.

The finds of tin were recorded in Sardinia as well, on four Nuragic sites (Abini-Teti, Forraxi Nio – Nuragus, La Maddalena – Silanus/Lei and S’Arcu ‘e is Forros – Villagrande Strisaili), as discussed by F. Lo Schiavo in »The problem of early tin from the point of view of Nuragic Sardinia«. Although the finds of tin were accompanied by ingots of copper, lead and iron, metallurgical activities have not been identified so far. In spite of that, the author states the belief that Nuragic Sardinia knew metallurgy, and that it was at the level of the Bronze Age Mediterranean.

The most recent finds of tin in Sardinia are treated by M. A. Fadda in »Villagrande Strisaili-Nuoro – the discovery of tin near the megaron temple of S’Arcu ‘e is Forros«. The find is dated into Bronze and Early Iron Ages (15th–9th century B.C.). Since tin ore is not present in Sardinia, the author is quite certain that this metal was brought to the island, but its origin is still not known. Due to its position, Sardinia was an important port on the east-west-east route through the Mediterranean, so that Nuragic population used this geographical privilege for trade, very often with intermediaries from Mycenae, Cyprus and with members of the Proto-Villanovian culture.

The article »La métallurgie du bronze en Sicile (Italy)« by the author R. M. Albanese Procelli deals with the problem of use of tin in the metallurgy of bronze on this large Mediterranean island. On the one hand, material evidence related to bronze production (metal objects, ingots, vessels for metal casting, moulds and whetstones) was analyzed, and on the other hand, the analysis involved social relations, contacts and exchange related to metallurgical activities.

The fourth part of the book, »Metrology and Metal Trade Problems«, sheds light on the problem of evaluation in metal trade, and unfortunately consists of only one, albeit very interesting text. The article entitled »Investigating Weight Systems in Nuragic Sardinia«, by the author M. Ruiz-Galvez Priego, based on archaeological finds, is an attempt to determine which weight
measuring systems were in place and used in the Mediterranean during the Bronze Age. In this text, the author treats the problem of the existence of several measuring systems on the island on the example of Nuragic Sardinia, the most important port between the east and west Mediterranean. Archaeological finds studied for that purpose were weights, axes and ingots from Nuragic temples, proving that in Sardinia at least two measuring systems were accepted – Aegean and Asia Minor. At the end, the author made an interesting parallel with group finds from Slovenia (Grabe and Kalinski Vrh) from Late Bronze Age, and concluded that three measuring systems from the Mediterranean were accepted in central Europe in Late Bronze Age – Aegean, Asia Minor, and perhaps late Minoan.

At the end of the book two more texts were not presented at the Symposium in Liège are published, which deal with important problems of the origins of tin in the Mediterranean. The first text, »Ancient Potential Tin Sources in the Aegean« (N. Skarpelis), discusses possible sources of tin in the Aegean. This very clear article possesses an even educational quality, since it discusses briefly and in simple terms the types of deposits of tin in the Aegean basin. In the Early Bronze Age of the Aegean, arsenic bronze dominated, while tin bronze started dominating only in Late Bronze Age. So far the deposits of tin used for producing this type of bronze are not known. The author suggests that in prehistory small, in modern sense economically not profitable deposits, existed, which are not known today.

The last text in the book is the work of J. E. Dayonn, the author of the already famous article from 1971, which dealt with the issue of tin in antiquity (The Problem of Tin in the Ancient World, World Archaeology 3: 49–70), where an outline of potential tin sources was given, from Iran to Cornwall. This new article of the same title (The Problem of Tin in the Ancient World: Part 2) represents a certain type of a follow-up, where the thesis on the possibility of exploiting rich ore-bearing zones in Africa and central Asia is presented (the latter was discussed in the article by J. Cierny and G. Weisgerber in this book). The author advocates the theory that tin in the Mediterranean was brought from distant areas, which fail to provide archaeological evidence that they had contacts with the civilization of the Bronze Age Mediterranean. The territory around the lake of Vicotira, namely the Ankole-Karagwe tin field is discussed here. Although even Egyptians organized expeditions in those areas in order to procure luxury goods like gold, ivory and ebony, it was not until Phoenicians, around 1000 B.C., that tin from this territory was exploited. The analyses showed that it was the very same tin that was present in ingots on the Phoenician merchant ship sunk near Haifa.

The discovery of technology of obtaining metals, especially bronze, and introduction of tin in the production of bronze, significantly influenced the development of the Euro-Asian continent. The finds of tin in archaeological sites and shipwrecks, as well as a large number of articles of tin bronze, show that tin was in extensive use during the Bronze Age, and that it was not rare and difficult to obtain. Tin was traded in large quantities, and Bronze Age metallurgists had enough of it to experiment with various types of alloys in order to reach the desired results in the production of bronze. Thus tin was given one of the most important roles in the history of civilization, and that it was believed to be a third precious metal is fully justified. That is why the expression, which was in use for a long time in archaemetallurgy – tin mystery – loses its meaning more and more.

The book »The Problem of Early Tin« represents a true jewel for experts interested in archaemetallurgy. Although its subject matter is limited to the Mediterranean basin, it is of importance for the study of tin in a much broader territory – from Western Europe to Middle East. Regardless of the fact that none of the texts in the book provided a precise answer as to from where tin ore was brought in order to obtain this precious metal (which is not possible to answer at today’s level of research), an extraordinary contribution was made to the understanding of these issues. One volume collects all relevant papers on archaemetallurgical issues of the Bronze Age Mediterranean Basin. It is my hope that in the decades to come this book will not remain a lone example in archaemetallurgical literature dealing with issues of tin in prehistory.

Dragana ANTONOVIĆ

1 The mentioned mountain of Cer is located in western Serbia, and together with mountain of Bukulja in central Serbia (the manufacture of processing of tin in rural households has survived until the modern age in the latter mountain) is recognized as the only important deposit of tin oxide in the central Balkans.


Позната серија Праисторијски бронзани налази (PBF), за- снована је од самог почетка на објављивању ригорозно ода- бране и документоване грађе, најуже артефаката од бронза, а затим и оних израђених од осталих метала. Дуготрајна сери- ја, уређивања високом струментошћу није одустајала од овог принципа, већ ће је напротив обогатила. Изделиви много- бројне фондове европских музеја на посебне одаље, ова серија је закорачила и на тло Мале Азије и Леванта. Уколи- ко је изређена категорија артефаката у датој географској це- лини превазилазила обим једне свеске, тада су, чини се без ограничавања додавање нове. Пример праисторијских сеци- ра из Полске то добро илуструје – до сада су објављена три