

Aspects of ancient metallurgy

Abstract

These 22 papers dedicated to various topics related to ancient metallurgy, from prehistory to Crusader times in the 12th century CE, appeared in a Special Issue 2017 of the journal "Materials and Manufacturing Techniques", Taylor & Francis in volume 32, Nos.7-8, page: 709-925.

Volume 3 Issue 5 - 2018

Alessandra Giumlia-Mair

Department of Ancient Metallurgy, Italy

Correspondence: Alessandra Giumlia-Mair, Department of Ancient Metallurgy, Italy, Email giumlia@yahoo.it

Received: November 16, 2017 | **Published:** September 11, 2018

Book presentation

Eight years after the 2009 special issue on "Manufacturing techniques from Prehistory to the Renaissance", that covered more materials, from stone, to glass, painting, metals and ceramics, archeology has been once again guest of the Journal Materials and Manufacturing Processes. The 2017 special issue is entirely dedicated to various "Aspects of Ancient Metallurgy", from the mining of ores, through smelting, distribution, workshops, finished products and special technologies and finishing of objects. The essays in this volume highlight the production and processing of metals through the ages, from the beginning of metallurgy to medieval times, and covers various regions, from Portugal to the UK, from Italy to Central Europe, to the Near East, Africa, India and South America. Since at least three decades scientific analyses are regular and integral part of archaeological research, while before analytical programs existed, but were the exception. Nevertheless, there are now cases in which some kind of analytical work is carried out just because having analytical data attached to a paper as an appendix is "fashionable" and seems to be a must for the modern archaeologist, but these studies are often without plan and certainly not a relevant research. The papers collected in this issue focus on finds and objects in context, as cultural documentation and key for the understanding of the metallurgical techniques of a period. For these studies the authors used manifold approaches, thus comparing previous analyses and reading ancient texts, applying anthropological examination and detective work, as well as, obviously, analytical methods.

What we have learnt in the few decades since the study of systematic ancient metallurgy was born, is that we have to know where metals come from, how they were smelted, how the working processes and alloying practices changed their properties, and how they were finished. We know now that the analytical part cannot be separated from the cultural, historical and archaeological context. Only in this way we can untangle complex tales and hidden matters, discover technology transfers, ritual usages, sophisticated processes, religious meanings and artisan's accomplishments from items placed in burials, lost in battles, and sold in far away ancient towns. Scientific testing and classical, historical and archaeological examination must be employed in parallel. This special issue is divided in two sections: the first is dedicated to mining, and to gold, tin, and copper and its alloys, the second to the extraction and working of iron. Both sections present new studies, carried out on old and new materials. Several illustrate the characteristics and details of amazing pieces, sometimes from little known regions. The issue begins with an excellent and very comprehensive study by Simon Timberlake¹ on Early-Middle Bronze Age mines in Britain, covering copper, tin, gold and lead-

silver prospection, extraction, tools, dating and provenancing. In her outstanding contribution Barbara Armbruster presents the manufacture of the superb gold jewelry from a BA hoard found at Guînes, Pas-de-Calais, in Northern France.² Xose Luis Armada et al. discuss the manufacture of the Recouso treasure, a hoard of Iron Age gold objects from the Iberian Peninsula,³ with special attention to the study of the cores and organic remains inside the gold pieces. Natalia Rueda Guerrero and Jairo Escobar Gutiérrez reconstruct the production process of the long lost Muisca Siecha raft from Columbia by reverse engineering methodology, a new application of computer-aided calculations.⁴ Salvador Rovira and Martina Renzi give a brilliant overview of early technologies for metal production in the Iberian Peninsula,⁵ and Elin Figueredo et al.,⁶ illustrate their recent experimental work on the smelting of tin ores. Two contributions on Chalcolithic materials from Portugal follow: the first by Pedro Valério et al.,⁷ on Vila Nova de São Pedro, and the second by Filipa Pereira et al.,⁸ on Moita da Ladra. Ana Ávila de Melo et al.,⁹ discuss the peculiar manufacturing technique and the possible provenance of a Middle Bronze Age pin from Tapada da Ajuda (Lisbon, Portugal). Iron Age copper-based materials from a workshop in Northern Italy are discussed by Livia Stefan et al.¹⁰ The part on Prehistoric copper is concluded by an interesting paper by Sharada Srinivasan¹¹ on the Peninsular Indian bowls from Adichanallur and Boregaon in India, made of high tin beta bronze that, because of their unusual composition, had to be worked in a special way.¹¹ Presentations on Roman materials begin with the paper by Arne Jouttijärvi¹² on Roman alloying practice, based on an amazingly large database of around 8900 analyses.¹² Filipa Lopes et al.,¹³ discuss the antropomorphic handle attachments of the Roman situlae from Conimbriga (Portugal). Estelle Ottenwelter et al. describe in detail the production process of Early Medieval "Gombiky", i.e. spherical pendants made of precious metals or gilded copper, from the "Lumbe Garden" cemetery at the Prague Castle.¹⁴

The section on iron begins with a paper by Alessandra Giumlia-Mair et al.,¹⁵ on an Iron Age smithy in Zambana (Trento) in Northern Italy. Janet Lang gives an excellent overview on Roman iron and steel, and also discusses the production of steel in the furnace, surface carburisation and fire welding.¹⁶ Adam Thiele et al. present the metallographic examination of two medieval knives from Kobilic (Republic of Croatia), one of which is pattern-welded and, at least for the moment, the only example of this technique in Croatia.¹⁷ Francisco J. Franco Pérez & Marc Gener Moret¹⁸ discuss the extensive work carried out in the "haizeolac", the mountainside ironworks in Biscay (Basque Country, Spain): survey, excavation, experimentation and materials characterization.¹⁸ Jiří Hošek et al.,¹⁹ present the metallographic work carried out on an interesting example

of pattern-welded and silver inlaid sword, excavated at Kyjov, in the Czech Republic, and describe their experience with the manufacturing process of the replica.¹⁹ Papers on non-European materials consist in Vincent Serneels' work on the smelting site of Korsimoro in Burkina Faso,²⁰ where he conducted two fieldwork campaigns in 2011 and 2012, and identified chronologically separated and different traditions in the period between 600 and 1000 AD. Sharada Srinivasan describes the technique of production and the characteristics of ultra-high carbon 'wootz' from Tamil Nadu at Mel-siruvalur.²¹ This very special steel was apparently exported to the West in antiquity, and might be the famous ferrum Indicum, mentioned by Greek and Latin texts. Finally, the last paper, by Béla Török et al., discusses the manufacturing process of medieval arrowheads and chain-mail fragments from the Crusader Al-Marqab citadel (Syria).²²

Acknowledgements

None.

Conflict of interest

Author declares that there is no conflict of interest.

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