



Joyce C. white and Elizabeth G. Hamilton, editors 2018. *Ban Chiang, Northeast Thailand, Vol. 2B: Metals and Related Evidence from Ban Chiang, Ban Tong, Ban Phak Top, and Don Klang*

202 pp., three appendices, (11 supplemental data tables, 25 distribution plans, glossary; 66 figures, 21 color inserts, 80 tables).

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This volume (2B) is an introduction to the analysis of metals and related contextual evidence for Ban Chiang, Ban Tong, Ban Phak Top and Don Klang in northern Thailand. It provides a consistent, overarching, and thought-provoking theme—the significance of the metallurgical tradition—and an effort to explain the early metallurgical history of this region of northern Thailand and the consequent changes to it across the Metal Age. An additionally clear and constant theme is the importance of both mortuary and non-mortuary evidence to give a full picture not only of the metallurgical tradition but also of the socio-cultural context for metal production and use. This insistence may appear to be rather particular, oddly specific, and perhaps unnecessary to students outside of Southeast Asian archaeology, history, and art history for in recent decades this sort of full contextual examination of metallurgical technology in ancient societies in other parts of the world is increasingly familiar. However, within the historiographic context which engaged the Southeast Asian area about the advent of metallurgy, such research has developed with particular heated deliberation. Perhaps because of the history of explosive and provocative secondary literature on the topic with regard to northern Thailand in particular (Higham 2020), the singular and insistent focus on the four sites and what their data provide for analysis provided here, Volume 2B is especially welcome in its detailed and systematic reporting of results of the most recent and well-regarded testing of carefully excavated data from the target region. Even if one might not necessarily concur with all the

results of the study, the provision here for new test results is a significant contribution and a starting point to build on.

Joyce C. White—Executive Director of the Institute for Southeast Archaeology at the University of Pennsylvania Museum since the initiation of the Ban Chiang project in 1982, and the Editor in Chief of the series of volumes that report on these many years of study and analysis for that project—lays out very clearly the aims of this volume in Chapter 1. Referring to the missteps and incomplete reporting in the past, she aims to present not only the evidence and the analysis of that material, but also the methodology by which the data were amassed. The set of volumes, but particularly this one, has as a goal to illustrate the value of analyzing full assemblages of metallurgical remains from anthropological and technological perspectives in order to understand ancient metals in their social contexts (1). She makes clear the organizing principal of the chapters to address: systematic assessments of the typological range, variation in metal composition and manufacturing techniques, evidence for on-site production activities, and contextual evidence for deposition of metal finds. The plan is to give a comprehensive and far richer understanding of ancient metals and generate a model for others who pursue the same. A more thorough, introspective and critical examination of this, or any other, set of material would be difficult to find!

Chapter 2, “Methods for Analysis of the Metal Artifacts,” is written by Elisabeth G. Hamilton a Research Associate at the Institute for Southeast Asian Archaeology since 1999. This chapter lays out the methods used in the archeometallurgical study of metal artifacts from the four sites listed above. The collection used in this study included 639 well-provenienced prehistoric and proto historic artifacts excavated in 1974–1975 by the Penn Museum and the Thai Fine Arts Department along with 110 metal artifacts from historic/

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recent contexts. The goal to test a robust sample was met and defended as fortunate but deliberate without reference to previous studies and their results, arguing that they were incomplete. The condition of the collection, the recording systems, and technical analyses were reviewed for their conservation and storage histories including how equipment, testing possibilities and researchers changed over time. The underlying assumption was that understanding the technology of manufacture required a suite of techniques known to the material sciences. The following techniques were applied to the selected collection: optical metallography to discern techniques of forming and heat treatment (117 samples chosen as sound and uncorroded, from varied classes, types and dates); compositional analysis to determine elemental content and the quality of elements added (PIXE spectroscopy or SEM/EDS testing of 56 samples); and microhardness testing to determine if techniques were applied to alter the hardness of the material (Vickers testing of 35 samples). This chapter painstakingly describes all methods and the history of their application in previous analyses, as if the volume were intended as a didactic introduction to and defense of these methods. Such care and thoroughness in presentation suggests a projected audience for the volume of specialists who could appreciate the vigorous nature of the testing, students who were being trained about how to mount a research project and professionals inexperienced either in metallurgy or material science. Observations on what the testing suggests about the industry and its social and technical implications were left to later chapters.

Chapter 3, “Classification of Metal Artifacts,” is also authored by Elisabeth G. Hamilton and presents a comprehensive classification program for all metal objects, intact or fragmentary, even if a function could not be assigned to every artifact. The chapter provides basic information on type and manufacturing technology foundational to implementing a life history of artifacts to follow in Chapter 7. Formal visual analysis was applied, recorded and provided the basis for the categorization of all metal items in the inventory. It provided the basis for the projections that implied analysis of function, sociological value, manufacturing goals (for individuals or corporate use, for instance). Observations about standardization of type or manufacturing led the author to propose, for instance, that since both hafting and socketing within-class existed simultaneously, that suggests that in the axe/adze category there was regional variation even though a recognizable artifact style/type was evident over time and space (p. 59). Or, among the metal rods studied, materials of manufacture varied suggesting difference in function (p. 59). Particularly of interest in this chapter is the observation that tools such as arrowheads and spear points which could have been used as weapons, are not common—not as typical as bangles, for instance. This scrutiny ultimately led to the suggestion that most metal items from the four sites were used at the individual rather than at the group or collective level (p. 60).

Chapter 4, “Technical Analysis of Metal Objects: Results” is written by Elisabeth G. Hamilton and Samuel K. Nash and begins with a definition of archaeometallurgy as a way of collecting technological data about the behavior and properties of metals and other materials related to metal artifact production. In this instance, of course, the case study focuses on analysis of the metals from the four base archaeological sites in northeastern Thailand, in order to reimagine the workings of that entire technological system and present evidence for past technical systems and their changes over time. The recording of the technological findings is listed by artifact type but is prefaced in the chapter with a primer of the most basic definitions of metallography that includes examples of the application of elemental and optical metallographic testing methods on copper-based and iron metal artifacts from the sites. Compositional and metallographic analyses that follow demonstrate how ancient metalworkers chose alloys and treatments for different classes of artifacts over time. Reasoning on regional variation in the knowledge of and choices of the workers lead the authors to suggest that the networks of communities of metallurgical practice effected economic and social systems over time. These laboratory analyses revealed several distinguishing characteristics: first is the long-standing conservatism in both technique and artifact styles over the two thousand-year period studied, even though the metallurgical skills were expanded as classes of products remained stable. Second, at no time did the bronze smiths regularly attempt to work harden their bronze implements, nor were there systematic attempts to carburize and quench iron. This suggests that there was little need to harden metal items (for use in warfare, for instance), and ratifies the observation that most metal items were ornamental. Finally, and perhaps most interestingly for the social historian, at no time did the extraction, working, and distribution of metal achieve the volume that would have required an organizing elite.

Chapter 5: “Metal Product Manufacturing Evidence; Crucibles, Molds, and Slag” written by William W. Vernon, Joyce C. White, and Elisabeth G. Hamilton follows on the previous analyses to have as a goal response to the issue of discerning local vs. imported metal artifacts and where particular artifacts were produced. Analyses of manufacturing equipment, especially crucibles and fragments, including slag, molds or parts of molds, were studied in order to see how the equipment facilitated the technological system of smelting and/or melting activities for which the crucibles used. Examination began with examination of how the crucibles themselves were made. The authors conclude that because of the absence of local ore, the prevalence of greenish dross, and the base analyses suggest that the excavated crucibles excavated from the four sites were used for copper-base metals, and not for smelting ores, suggesting that the process of raw metal extraction and finished artifact manufacturing were taking place in many other locations. That is, the full

production sequence from ore to finished product appears to have been segmented, decentralized and integrated with daily life in the villages (p. 122). Moreover, there may have been specialization in production of certain types of artifacts at particular sites although manufacturing expertise appears to have been widely available. The low rates of slag finds and absence of ore finds suggested to the authors that metal melting, both copper-base and iron, was apparently not taking place in the four sites under study here.

Chapter 6: “Depositional Contexts of Metals and Related Production Artifacts,” is a chapter written by Elizabeth G. Hamilton and Joyce C. White. Here the authors take on an interpretive role and demonstrate how reading the depositional contexts of artifacts is the key to understanding objects in their past social worlds (p. 125). Unlike many other life history studies of artifacts that focus only on the finished product, life history here can be understood to represent the record of objects from their manufacture through to their function in society. After reviewing the metal finds in both mortuary and non-mortuary settings, the authors conclude that in all four northern Thailand sites, the artifacts derive from a heterogeneous range of depositional contexts, but that the majority of deposits were not for burial purposes. Only 15.3% of metal artifacts were burial associated, 8.1% were found in features and 65.3% came from the general soil matrix with the bulk of the evidence coming from the two Ban Chiang locales (p. 168). Chronologically, the earliest type and most numerous metal grave goods were bangles with circular cross sections, while in subsequent periods, new types appeared along with new ceramic types, grave rituals and some modifications in subsistence leading the authors to suggest that such differences were part of a complex of cultural changes in the region. In the late period bangles were even more elaborated. Complete implements were also found in grave contexts, and included small to large points, blades of various hafting methods and less common adzes/axes. Complete examples of these implements were found outside of the grave context as well. Graves of young children were found to contain more metal goods than their adult counterparts. No points were found in children’s graves, while few metal items made their way into female graves of any age although most graves contained metal bangles. Evidence of local on-site metal manufacturing (slag, molds, burnt clay, crucible remains, incomplete items) and use were found outside of burial contexts at all four sites. With these observations made from analysis of debris from across the sites, the authors have created a fuller picture of the role of metallurgy for both the living and the dead.

Chapter 7: “Life History Perspectives on Metals and Related finds” is a chapter written by Joyce C. White and Elizabeth G. Hamilton with the aim of showing the value of examining grave goods and non-grave good evidence of metal artifacts in helping to reconstruct the full social context for

metal use at a site, or region. This type of examination can address such questions as technological transmission between regions and regional economic organization of metal and metal-object production and consumption. Three questions drive the analysis in the chapter. First, What is the initial evidence for copper-base and iron technology?; second, What is the role and prominence of metal-related activity over time and space?; third, Does the mortuary and non-mortuary use of any item (in this case bangles) vary during the same period?

Emphasis on the full range of evidence from object creation to final discard lead the authors to make the following projection: copper-based metal was used in daily life from the beginning and not in burial contexts. Such artifacts appear not to have been precious and were not recycled as casting was practiced from the initial appearance in all four sites. During the Early Period Copper-based items were present in both burial and non-burial contexts in the Early Period, with some increase in metal finds in living contexts at BC and BT. The earliest evidence for iron came from non-burial contexts at BC. Metal items were not recovered from all sites at the same time, suggesting that the production was sensitive to varied local practices and uses. Differential access to metal items varied from site to site and could relate to consumer choices and behaviors.

This assessment of the typological, temporal and distributional evidence of all metal items can and hopefully will be used for comparative analyses across the immediate region, but also with sequences in other parts of the larger region where it could hold implications for broader questions about the advent of metallurgy, technological transfer and social change.

The strength of the analysis in Volume 2B is threefold:

1. It makes available a detailed and complete inventory of all metal artifacts for these four regional sites;
2. The analysis enables a comprehensive perspective on understanding the complex history of the metal period in the immediate area of the four sites while possessing implications for previous scholarship and models for future research.
3. It could be used to point to broader trends in neighboring regional traditions in Thailand, or even further afield including Eurasia and China.

It may be that these strengths also expose the vulnerability of the report, especially with regard to the third feature— that of neighboring regional traditions. It is here that although the presentation of this material provides clear patterns in the production and use of metal artifacts across the area and time of the study two nagging questions remain. First and perhaps most important is the issue of dating and chronology. The focus of the decades long debates among those who work in

Southeast Asia (Higham 2020) was and still is dating and thus chronology. Not put to rest here, all researchers would benefit from knowing and respecting the most recent studies of materials from southwest China (Chiou-Peng 2018, 2020; Yao et al. 2020) on their own merits where early and reliable dating suggests that routes to and dating of Southeast Asian metallurgical technology must be reexamined. And in the case of Eurasia or Inner Asia the complexity of the transmission into Asia and its dating and chronology could be rethought from reading through Vince Pigotts' recent survey with an open mind (Pigott 2018). Moreover, the scientific methods of analysis on metal artifacts is no better exemplified and applied than by Sergey Miniaev to Inner Asian materials (Miniaev 2018).

What Volume 2B offers in particular is a detailed, descriptive, analytic and transparent reporting of the material—the data will prove invaluable in our quest to reimagine the emergence and use of technological know-how across the broader region if such exploration remains open-minded and flexible.

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