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## From Community Craft to Regional Specialization: Intensification of Copper Production in Pre-state Thailand

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Mainland Southeast Asia provides an opportunity to examine the relationship of craft specialization and politico-economic evolution in an Old World context where the development of states was delayed, occurring two or more millennia later than in continental neighbors to the north in China and to the west in India. Moreover, the pattern of Southeast Asian state development does not necessarily fit easily into the models of state formation usually referenced by archaeologists (Bentley 1986; Bayard 1992; Christie 1992; White 1995a). As in Europe an established metallurgical craft tradition, not subjugated to ruling elites, flourished well before the development of the region's earliest states (White 1988). Since elite manipulation and control of craft production has often been regarded as a key factor in the development of political centralization, an examination of this component of the Southeast Asian pre-state economy may illuminate a significant variant in the processes of pre-state political-economic interaction. We must stress, of course, the paucity of published research in this region, and hence the potential that the proposals stated here will be substantially revised at some not too distant point. Relative to many other parts of the world, mainland Southeast Asia has seen very little problem-oriented research focused on craft production and prehistoric economic development. This paper proposes, instead, an initial hypothetical model, drawing upon the few data that are available, which can be evaluated and modified with further research.

The main thesis of this paper is that craft specialization since the prehistoric period in Southeast Asia has developed largely within a *community*-based mode of production organization. This mode is defined by Costin (1991:8) as "autonomous individual or household-based production units, aggregated within a single community producing for unrestricted regional consumption." The thesis will be explored by focusing on evidence in Thailand for copper production. We will furthermore argue that

Southeast Asia's long tradition of community-based specialized craft production has implications for the region's patterns and structures of accumulation of wealth and centralization of political power. In particular the community mode of craft production is one of several factors contributing to a *heterarchical* (Crumley 1987; White 1995a) emphasis in much of Southeast Asian sociopolitical development whereby relationships among various components of the system are often characterized more by flexible hierarchy and lateral differentiation than by rigid hierarchical controls.

V. Gordon Childe's focus on copper-base metal production as a basis for examining the evolution of craft specialization has special theoretical significance because by its very nature production of copper-base artifacts *must* entail some degree of specialized production in both senses of the term: economic differentiation as well as unusual technical skills. Due to the complexity and effort of the procedures involved, and the inherent nucleated distribution of the raw materials, producers must be fewer than consumers. Within the consuming region, not every household is likely to go to the ore sources, mine the ores, smelt the metals (having mastered all the controls and procedures necessary—often for more than one metal), alloy the metals, cast the objects (having made the crucibles and molds), and so forth. The very presence of metal production in a society implies what Costin (1991:4) calls "extra-household exchange relationships." However, Childe's argument that metalsmiths must be *full-time* specialists, and his postulate that "metallurgists were forced outside the kinship structure of . . . society" (McNairn 1980:42) are almost certainly not true for Southeast Asia.

We focus in this paper on that core zone where the earliest *indigenously* generated states formed in Southeast Asia (Wheatley 1979, 1983): namely, the drainage basins of the Irrawaddy, Chao Phraya, and Mekong rivers as well as the central and southern

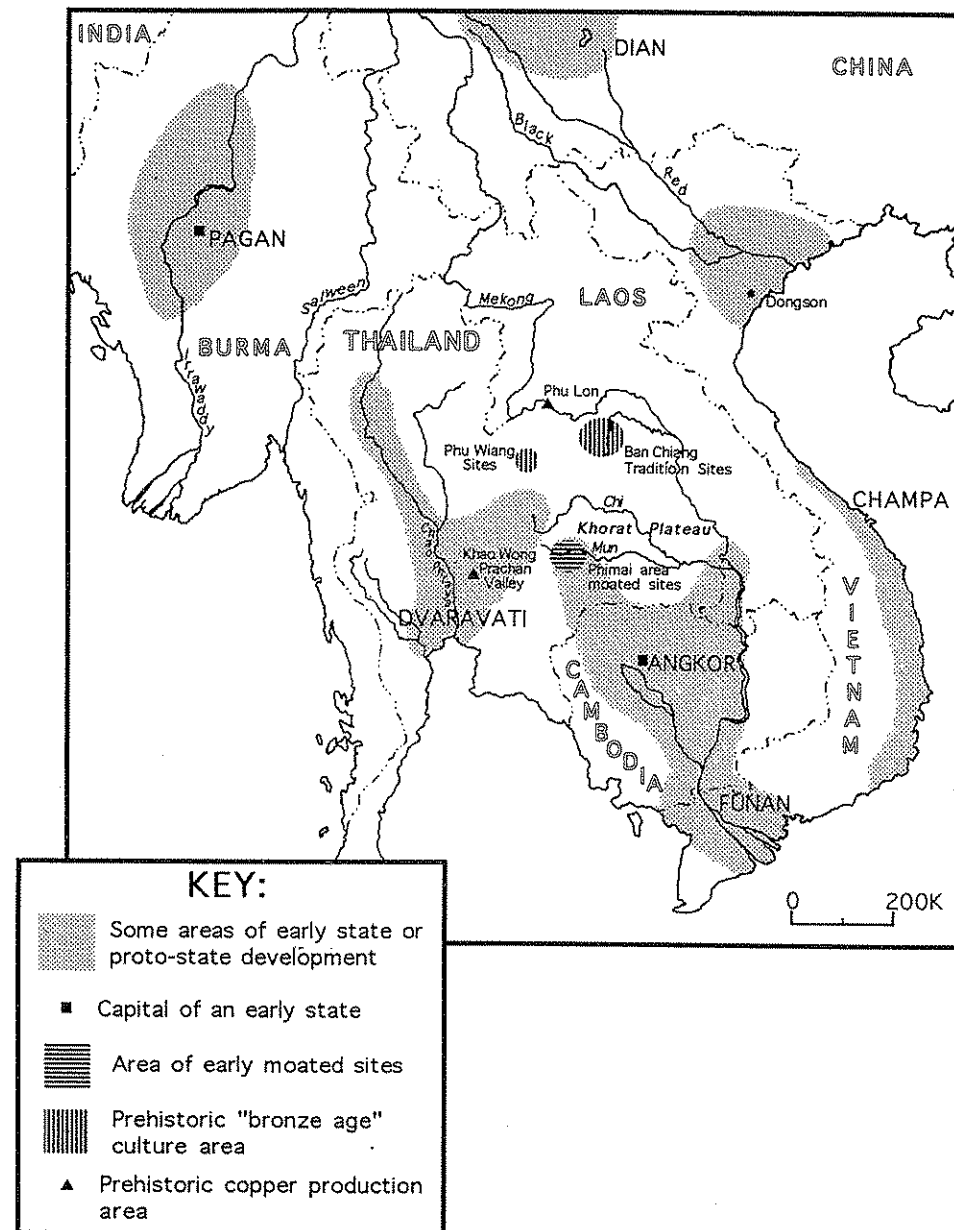


Figure 13.1 Locations in mainland Southeast Asia mentioned in the text.

portions of Vietnam (Fig. 13.1). Historians have argued that societies in this core region adopted Indian religio-political models in the first millennium A.D. and thereby generated the earliest states in those regions with little intervention in the political processes by Indians themselves (Wheatley 1979, 1983; Wolters 1982; Legge 1992:25). Northern Vietnam is not considered in this discussion since its cultural trajectory is somewhat distinct from at least the second millennium B.C. and quite possibly earlier. Processes of political centralization among the cul-

tures along the Red River Valley are considered distinct from those of the core area and intimately connected with Chinese long-term interest and intervention in the region. China annexed northern Vietnam in the late first millennium B.C. and imposed Chinese-style state administrative structures (Wheatley 1979, 1983).

The prehistoric data discussed come from Thailand where metal production sites have been excavated and we have the best control over chronology and quality of metal production data. These data are

particularly pertinent to the examination of politico-economic development in the Mekong and Chao Phraya drainage systems, which ultimately saw the development of centralized societies by Mon-Khmer ethno-linguistic groups. The ethno-linguistic groups which founded the Cham civilization along the central and southern coast of Vietnam and the Pagan civilization in the middle reaches of the Irrawaddy were, comparatively speaking, "immigrants." Speakers of proto Mon-Khmer, also known as Austro-Asiatic, were probably the original agricultural settlers of mainland Southeast Asia and probably inhabited this region since the fourth millennium B.C. We have an opportunity, therefore, to examine relatively autochthonous processes in a cultural tradition that extended from agricultural settlement and culminated in the Dvaravati and Angkorian civilizations.

The critical time period for discussion would extend from at least the earliest appearance of the

Southeast Asian metallurgical tradition, which may date from about 2000 B.C. (White 1986, 1988), to the late first millennium B.C. For most of the period we have direct archaeological evidence of copper production. Toward the end of this period site hierarchies first appear (or at least significantly larger sites), and the earliest states emerge about the mid first millennium A.D.

We will discuss archaeological evidence from northeast Thailand as an example of a less intense production system that may have characterized the earlier stages of metal production beginning in the second millennium B.C. We will follow with the evidence from central Thailand as an example of how specialized production might have intensified from that initial pattern, especially during the first millennium B.C. Inferences on the relationship of craft production to political developments will be drawn from archaeological, ethnographic, and historic evidence.

## PREHISTORIC PRODUCTION OF COPPER-BASE ARTIFACTS IN NORTHEAST THAILAND

### PHU LON: A COPPER MINING AND ORE DRESSING SITE

Evidence for primary metal production of copper has been identified at a copper mining complex in northeast Thailand in the mineral-rich hills just off the northwestern edge of the Khorat Plateau. The site of Phu Lon, excavated by the Thailand Archaeometallurgy Project directed by Vincent Pigott and Surapol Natapintu (Pigott 1984, 1985; Pigott and Natapintu 1988a, 1988b; Pigott et al. 1992; Natapintu 1988), has produced dates from the early second millennium B.C. and the first millennium B.C., and hence is contemporary with metal-consuming sites of the Ban Chiang Cultural Tradition on the adjacent Khorat Plateau. Several excavated locales surrounding 25-m-high remnants of protruding host rock show evidence of mining, ore dressing, and, to a lesser extent, metal processing. The depth of mining debris, reaching in some locations 10 m and probably originally extending hundreds of square meters in area, indicates that a large volume of ore was mined from this site.

Tools recovered from initial steps in mineral exploitation include hundreds of broken or exhausted mauls used to extract the ore from the host rock deposit, and hundreds of smaller cobbles used to dress or crush ore against anvils. The locales excavated surrounding the remnant mining shafts revealed extensive deposits of pulverized host rock, sometimes "crushed to a relatively uniform size" (Pigott and

Natapintu 1988b:5), with numerous areas suggestive of crushing stations: anvil stones associated with small crushers and sometimes bits of malachite.

One of the excavated locales which produced evidence of metal processing activity was the Pottery Flat. It yielded over 70 fragments from small crucibles typical of northeast Thailand, and abundant charcoal. The excavators suggest these finds may relate to ore smelting using a crucible smelting process that would help explain the absence of any evidence for fixed smelting installations. There was little slag found, which might be because malachite was being smelted, or because native copper was being melted. The recovery of only two mold fragments and only one metal artifact during the excavations suggests that the casting of artifacts generally took place somewhere else. The relatively small amount of evidence for smelting may mean that dressed ore was floated down the Mekong to smelting locations closer to areas with more abundant fuel resources (Charoenwongsa and Bronson 1988:108).

There is some evidence of habitation debris mixed in with the mining, dressing, and metal processing remains, including cordmarked pottery sherds, shouldered adzes, a figurine, "net weights," and spindle whorls. However, animal bone and evidence for structures were not recovered. Surveys revealed no evidence for a nearby permanent settlement devoted to exploiting this ore resource or producing in volume either ingots or artifacts for export to the surrounding region. At Phu Lon, details of the pottery and stratigraphy are consistent

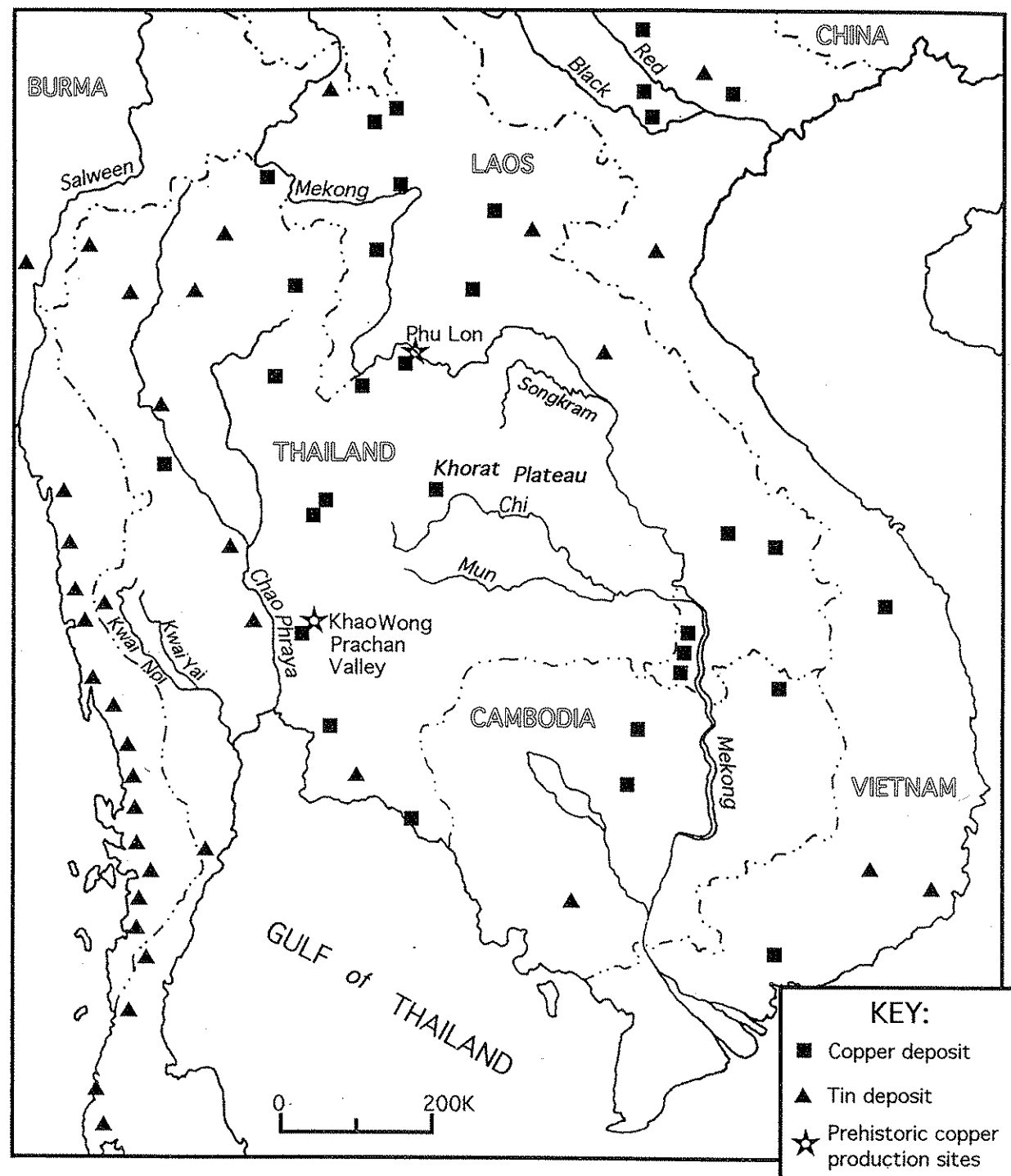


Figure 13.2 Distribution of copper and tin ore resources (after Murowchick 1989:403).

with intermittent exploitation by several groups (Pigott et al. 1992). Interestingly, the products and debris of stone adze and bracelet manufacture were intermixed with the ore processing and habitation debris. Evidence has appeared in other second mil-

lennium sites in Thailand (e.g., Huai Yai and Non Pa Wai in central Thailand; Natapintu 1988:116) for the co-occurrence of metal with stone tool and bracelet production, a context we will term multiple product production sites.

### COPPER CONSUMING SITES IN THE SAKON NAKON BASIN

Sites from the vibrant and innovative Ban Chiang Cultural Tradition on the adjacent Sakon Nakhon Basin of the northern Khorat Plateau dating from at least the third and probably the fourth millennium B.C. provide evidence of consumption as well as some production of metal artifacts during the second millennium B.C. As copper or tin ore deposits are absent from the Sakon Nakhon Basin (Pigott 1985), the metal itself must have come from a locality some 100 km or more distant, possibly from sites in the eastern Petchabun foothills like Phu Lon, or possibly from Laos (a likely source of tin, Fig. 13.2). Mining and probably smelting thus took place some days' journey from many of the consuming villages, but so far a major prehistoric copper smelting site has yet to be identified in the northern part of northeast Thailand.

The recovery of tin-bronze artifacts from second and first millennium B.C. grave and habitation contexts in village/cemetery sites like Ban Chiang and Ban Na Di provides evidence for the nature of the consumption. Most of the metal artifacts from those two sites were personal ornaments, particularly bracelets and anklets (Fig. 13.3c-e, g; White 1988; Higham 1988). Relatively intact examples came from a few graves of men, women, and children, but about 70 bangle fragments from Ban Chiang<sup>1</sup> and 27 from Ban Na Di (Higham and Kijngam 1984:96) were recovered from non-burial contexts. Only a few examples of implements were recovered, including the occasional point or fishhook, usually from non-burial contexts (Fig. 13.3f, h). From two Ban Chiang graves of the Penn/Fine Arts Department of Thailand (hereafter, FAD) excavations came one socketed spear-point and one socketed adzehead (Fig. 13.3b, i). No socketed implements have been reported from Ban Na Di (Higham and Kijngam 1984:83).

The presence of crucibles and the rarity of slag at these same sites indicates that casting of some artifacts was undertaken at interior Sakon Nakhon Basin villages, but probably not the smelting of ores in any volume. The crucibles (over 80 pieces from Ban Chiang including several complete or nearly complete specimens; Fig. 13.3a) are similar in technology but possi-

bly a little larger in size than those recovered from Phu Lon (Vernon in White et al. 1991:201). Only a few sandstone fragments from molds likely to have been used to cast bivalve socketed implements are known from Ban Chiang and Ban Na Di (Higham 1988). Ban Na Di produced one fragment of a sandstone mold for casting small points. Clay fragments from Ban Na Di have been interpreted as deriving from molds used in lost wax casting of bracelets (Higham and Kijngam 1984:81). Thus some casting, perhaps primarily of small implements and jewelry, took place at Sakon Nakhon Basin settlements.

### PHU WIANG REGION: SPECIALIST PRODUCERS OF SOCKETED IMPLEMENTS?

Excavations in the Phu Wiang region in the northwest corner of the Khorat Basin raise the possibility of subregional specialization during the second millennium B.C. in the production of particular metal artifacts. In marked contrast to Ban Chiang and Ban Na Di, sites in the Phu Wiang region such as Non Nok Tha and Non Pa Kluay have produced several examples of axes, complete sandstone axe mold sets for cast bivalve socketed implements, axe mold blanks, as well as crucibles somewhat larger than those of Phu Lon or the Sakon Nakhon Basin sites (Bayard 1980; Wilen 1989; White et al. 1991:201). At Non Nok Tha, many of these production implements were recovered from graves.

A likely factor in the differential distribution of evidence for casting bivalve socketed implements may be the availability of sandstone—the raw material used in most molds for socketed implements recovered from northeastern sites. The Phu Wiang sites are within a few kilometers of the very sandstone used to make the molds (Bayard 1980:193), and such sandstone is not found in the interior Sakon Nakhon Basin where most sites of the Ban Chiang Tradition have been located. Therefore most of the casting activity in the Sakon Nakhon Basin sites, hypothesized to have been producing predominantly bangles (White 1988), may have relied on lost wax technology using molds of the clay that is ubiquitously available.

### MODELING THE SOCIOECONOMICS OF METAL PRODUCTION IN NORTHEAST THAILAND

#### INFERENCES FROM THE ARCHAEOLOGICAL EVIDENCE

In developing working models of craft production in its social and political context, Costin (1991) has

done the field of archaeology a great service by synthesizing a carefully thought out, multifaceted and elaborated discussion of variants of craft specialization and their possible archaeological manifestations. Her work provides rich guidance for moving

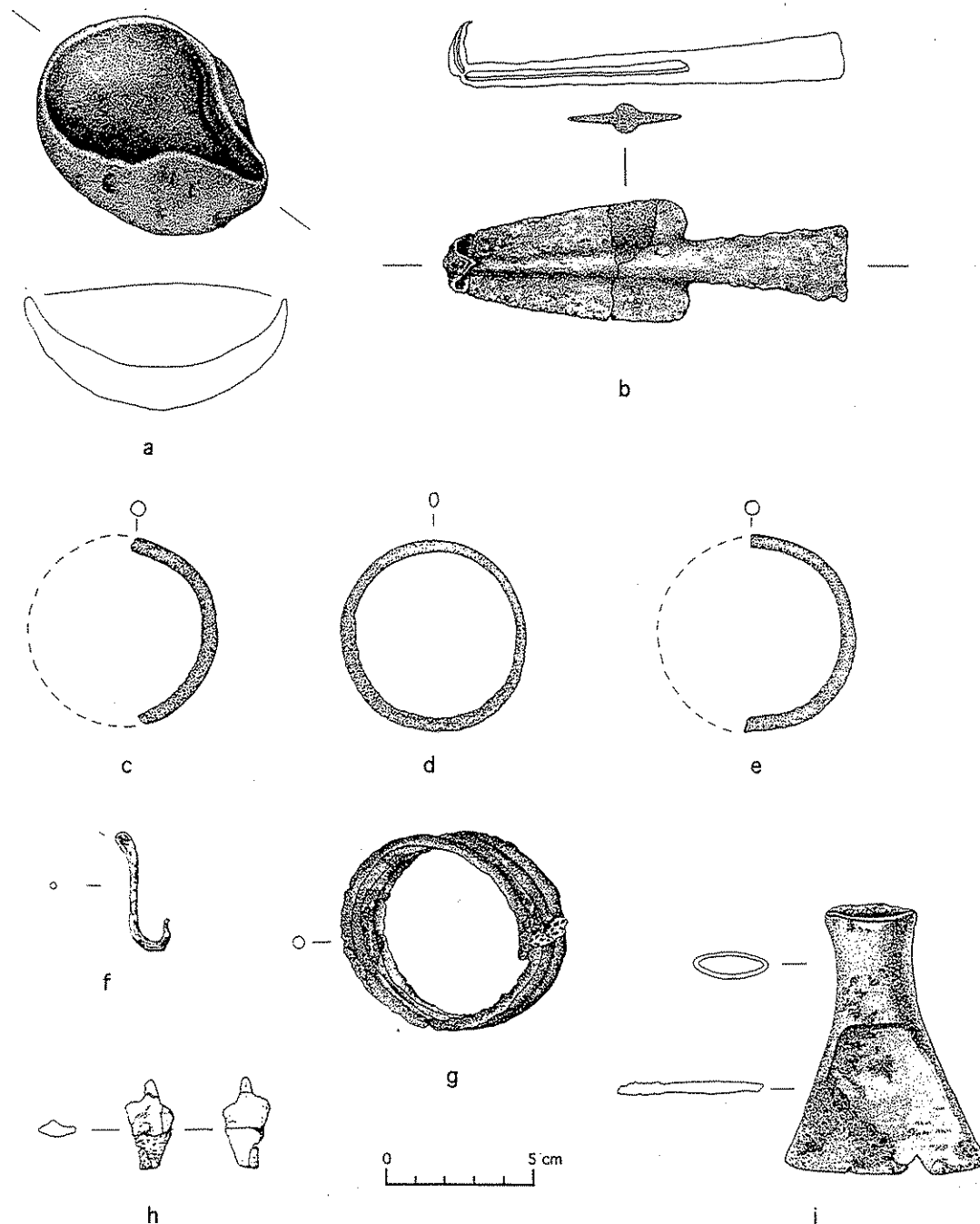


Figure 13.3 Crucible and bronze artifacts from Ban Chiang Cultural Tradition sites.

- a. Representative rice chaff-tempered clay crucible from Ban Chiang. Crucibles or fragments of crucibles of similar size, shape, and technology have been recovered from Phu Lon and other sites in northeast Thailand.
- b. Spearpoint from Ban Chiang Early Period III grave of a man probably dating to the early second millennium B.C. (BCES 762/2834 from Burial 76). The object is a low tin bronze with a hammered and annealed edge.
- c.-e. Anklets from a Ban Chiang Early Period IV grave of a four-year-old child (BCES 594,595,596/1984 from Burial 38). Bracelets and anklets from second millennium B.C. contexts usually are simple rings with circular cross-sections.
- f. Fishhook from a Ban Tong non-burial context (BT 890/1696).
- g. Bracelets from a Ban Chiang Early Period V grave of a middle-aged male (BC 393/1203 from Burial 23).
- h. Arrow point from Ban Chiang non-burial context (BC 715/1491).
- i. Socketed adze from Ban Chiang Early Period V grave of a middle-aged man (BC 694/1203 from Burial 23).

the discussion of craft specialization beyond minimal references to presence or absence of specialization, or "attached" versus "independent" specialists (Brumfiel and Earle 1987). While the kind of quantified data Costin prefers are as yet unavailable for Thailand, her discussion provides a means to develop a model of craft specialization for prehistoric metallurgy in Thailand that can be evaluated as research progresses. The following discussion presents what we might infer from the northeast Thai archaeological evidence itself, and in the next section, we will fill out the picture further by discussing ethnography of craft specialization in its Southeast Asian context. In general we will argue that current evidence fits a situation where independent producers and suppliers and a relatively broad and flexible group of consumers are being "served by a production system that minimize[s] production and transaction costs" (Costin 1991:11).

## DEMAND

Costin (1991:13) recommends characterizing demand before production organization because demand will determine production features such as "cost parameters, levels of output, appropriate technology and the exclusivity of distribution." The northeast Thailand cemetery evidence points to a society that shows some evidence of social differentiation or weak ranking (Higham and Kijngam 1984:441; Bayard 1984) but lacking an "elite class," a distinct, apical group with clearly defined restrictive social requirements (most often heredity) for "membership." In sites thus far excavated, while some evidence exists for somewhat more well-to-do areas and somewhat less well-to-do areas, no northeast Thai prehistoric site known to the authors has yet revealed a distinct, isolated area exclusively for exceptionally well-endowed graves as one might expect for "chiefdoms" in the classic sense (Peebles and Kus 1977). Moreover, the grave assemblages suggest that individual qualities such as age, sex, and social and economic roles played prominent roles in social differentiation (reviewed in White 1995a). The production equipment in Non Nok Tha graves indicates that craft specialists were recognized by society in the second millennium B.C., a pattern which has also been observed for pottery makers in central Thailand at about the same time (Higham 1989a). The lack of evidence for site size hierarchy in northeast Thailand before the mid first millennium B.C. supports an inference of low levels of societal ranking.

The distribution of metal artifacts in northeast Thai cemeteries provides some clues on patterns of consumption. Their occurrence as grave furniture is rare, occurring at Ban Na Di, for example, in 15% of

the burials (Higham 1988:137). Personal jewelry (mostly bracelets and anklets) can be found in male, female, and subadult burials, including those of young children. The occasional copper-base implement has been found in adult male burials. While metal artifacts tend to be associated with the sets of graves considered more "well-to-do" at Ban Na Di and Non Nok Tha, the association is not exclusive and their prominence in the grave furniture of these burials is not outstanding.

In sum, the distribution pattern of copper-base artifacts is not ubiquitous. Thus it does not support demand from a fully egalitarian population. On the other hand, copper artifacts are not so restrictively distributed or of such obviously high value as to imply demand from, or tightly controlled usage by, apical social elites or governments. Overall, the evidence for consumption implies that demand for metal artifacts came from social subsets in the average village. These subsets were not exclusively or tightly defined, but perhaps had, in most cases, somewhat higher status than average individuals. The picture of somewhat restricted access, perhaps controlled through social convention, thus falls somewhere between Costin's "general market of potential customers" and "elite patrons," probably closer to the former, all data considered.

## CONTEXT: EVIDENCE FOR INDEPENDENT SPECIALIZATION

While the archaeological evidence suggests that portions of the population had greater access to metal artifacts, there is little evidence to suggest that this group had exclusive control over production, distribution, or consumption. Several lines of archaeological evidence support the view that production organization was characterized by independent specialists as either individuals and/or communities producing for regional consumption, and not specialists attached to upper social echelons producing on command for elite exclusive use.

The nature and technology of the metal artifact inventory in itself implies independent specialists. Although the prominence of jewelry<sup>2</sup> indicates a certain concern with display of wealth and status, the excavated artifacts tend to be small and usually modest in execution. The remainder of the artifact inventory consists of utilitarian implements suitable for uses or activities in village contexts: axes, adzes, spearpoints, arrow points and fishhooks. The shape, size, and technology of these implements clearly indicates functional considerations rather than mere display qualities, and Costin indicates a utilitarian focus is more consistent with independent than attached specialization. Even the oldest (early second millen-



nium) spearpoint from Ban Chiang (Fig. 13.3b) was hammered and annealed. These post-casting modifications strengthen edges of bronze implements and may be considered characteristic of the Southeast Asian Metallurgical Province (Stech Wheeler and Maddin 1976; White 1988).

While the implements and personal ornaments commonly found in the Southeast Asian early metal artifact repertoire might have been useful for display of social differences, they are all suitable for *individual* ownership and display. Absent are large, hard-to-cast "ideological" artifacts which might display wealth or status of an entire *group*, or be used in mass social rituals—artifacts such as the Dongson drums from later first millennium B.C. northern Vietnam, or the piece-mold cast wine vessels of northern Chinese metallurgical tradition. Small artifacts are also easy to transport and distribute to a large and dispersed population of potential "customers" when compared with cumbersome and heavy large objects.

The evidence for casting procedures also supports small-scale efforts and outputs employing small units of production and small groups of producers—most likely kin-based. The small crucibles and small molds point to the production of individual objects, or occasionally a few multiples (e.g., the double arrow mold fragment from Ban Na Di), not mass-produced multiples of objects nor again large objects which might require larger groups of coordinated labor to produce. The production facilities in northeast Thai sites are simply designed and imply fairly short term use by being temporary (ore crushing locales) and/or small in size and simple in design (small melting installations at Ban Chiang and Ban Na Di). The absence of evidence for fixed smelting installations and the possible use of crucible smelting along with the diminutive scale of the production equipment and products themselves indicate a general economic theme of low capital investment and small work units (Pigott et al. n.d.). The evidence is consistent with economically motivated independent specialists but not with anything approaching workshop or patron-commanded production. Neither the scale nor organization of the facilities, nor the volume of output (if we assume for the present that the rarity of metal finds in archaeological contexts reflects modest output) are suggestive of any interest in economies of scale in either worker or site productivity.

### CONCENTRATION/DISTRIBUTION OF METAL SPECIALISTS

All excavations at sites of the Ban Chiang Cultural Tradition thus far have produced some crucible frag-

ments, suggesting that most villages had resident casters as individual specialists. However, not only is it unlikely that these village casters individually visited the ore sources and conducted the mining, ore dressing, and smelting at both tin and copper sources, but the Phu Lon data reveal no clear ceramic ties to sites of the Ban Chiang Tradition (except for crucibles of similar size, shape, and technology; Vernon, pers. comm.). The absence of evidence for a permanent village exploiting the ore resources for a long period coupled with the variability among the Phu Lon ceramics (e.g., three wares on the Pottery Flat) is consistent with a scenario where more than one group visited the site in the same general period. Mining expeditions, probably from villages closer to the ores than the "core" Ban Chiang Tradition sites, likely stayed for a period long enough (weeks? a few months?) to leave domestic items such as spindle whorls (see Burton 1984 for possible analogy).

The possibility that much of the dressed ore was transported to other locales (yet to be identified) for smelting, and that in turn metal in the form of ingots or cast artifacts was then transported to village sites for consumption and small scale casting, presents a fairly elaborated and differentiated production and distribution system. In addition, the Phu Wiang evidence indicates that some regions and/or several villages within a region may have specialized in the casting of certain portions of the metal artifact repertoire (bivalve mold cast socketed artifacts), taking advantage of their proximity to sandstone resources for the molds. The picture is one of a dispersed and differentiated web of metal makers undertaking different stages and aspects of the production, some of whom reside in individual villages, some concentrated in villages near resources. Hence there probably existed a mixture of interdependent but independent individual and community specialists.

For now we can only surmise mechanisms of distribution, but one suspects that the Mekong flowing right by Phu Lon, together with the finely feathered river system which drains the Sakon Nakhon Basin into the Mekong and to which the distribution of Ban Chiang Tradition sites seems to be related (White 1995b; Higham 1984), was a critical factor. In fact one wonders if the relationship between river transportation systems and copper production resources might be related to the uneven distribution of the "bronze age" in Thailand. Glover (1991) has concluded that cultures preceding the iron age in some areas such as the Khwai Yai and Noi river valleys in west central Thailand did not participate in Thailand's "bronze age" for reasons that remain unclear. While not exhaustive, Murowchick's (1989:403) map of Southeast Asian ore resources (see Fig. 13.2) does not show any copper in that region or along that river system.

## CRAFT PRODUCTION IN THE SOUTHEAST ASIAN CONTEXT: SOME OBSERVATIONS DRAWING ON THE ETHNOGRAPHIC RECORD

### INTENSITY

The intensity of production, the degree to which the activity represents a full-time or part-time endeavor (Costin 1991), and the degree to which the producer is divorced from subsistence activities, is a parameter that is difficult to infer directly from the archaeological record. Inferences on intensity tend to be indirect and often reliant on ethnographic analogy (although see Nil Kham Haeng discussion below). Independent producers are less likely than attached producers to be full-time (Costin 1991:18). Costin (1991:17) implies that technologically less expensive industries, which we would argue is the case in northeast Thailand bronze production, are more likely to be part-time than technologically expensive ones with *risk* being a major consideration.

Independent producers can be characterized as risk minimizers who will, if possible, combine economic strategies to remain somewhat generalized. . . . independent specialists remain artisan-farmers because instability of marketed food supplies makes reliance on markets for subsistence products risky. Thus if independent craft specialists can combine craft production with agricultural production, they will remain part-time specialists. . . . However, peasants can maintain such a semi-generalized strategy only when technology is simple or inexpensive. (Costin 1991:17)

A part-time level of intensity is consistent with ethnographic evidence from Southeast Asia. There are many reasons to assume that metal production was seasonal. When metallurgy first appears in mainland Southeast Asia, it appears in a sociocultural context of autonomous rice-growing villages, whose subsistence included not only domesticated foods, but a significant wild component (Higham and Kijngam 1979). Today the vast majority of the rural core area population's caloric needs are provided through agricultural activity (primarily inundated rice cultivation) taking place during the six-month rainy season and immediately thereafter (for harvest and transport of rice to storage; White 1995b). During the rainy season, large stores of the main source of protein—fermented fish—are also processed. This leaves several months during the dry season when food acquisition activity is sporadic and slow-paced, limited to trapping frogs, digging for snails, etc. Today, craft production in rural areas—of pots, weaving, metal smithing, basket making, salt extraction, etc.—is almost entirely confined to the dry season,

and is undertaken by individuals who farm during the rainy season. Ethnohistoric evidence also supports seasonal and part-time mining and smelting in Southeast Asia (Barthelemy 1938; Bronson and Charoenwongsa 1986). During the dry season, not only are individuals relieved from the tasks of plowing, planting, weeding, and harvesting, thus having more time available, but the absence of rains and the low humidity make crafts involving pyrotechnology (a) more "convenient" (one can perform production activities including firing outdoors without fear of interruptions from rain) as well as (b) more likely to be successful (for pottery, at least, high humidity can interfere with pre-firing drying of the vessels—critical for minimizing breakage during firing).

Moreover, any kind of significant long-distance travel for trade has traditionally (i.e., before the advent of all-season roads) been concentrated in the dry season. Again, not only is there free time, but forested areas are more open since the deciduous trees and shrubs have dropped their leaves, the above-ground portion of herbaceous flora has died off, and small and medium-sized rivers are dry or low. During the rainy season travel is considered very difficult due to dense vegetation, flooded lands, muddy roads, and frequently washed-out bridges. In sum, the dry season is the time for trade, travel, and craft production. Although not conclusively demonstrated, given the context of the early use of metals, the best assumption for the prehistoric period is that the scheduling of primary agricultural activities and craft activities complemented each other seasonally as they do today, and that metalsmiths provided for much of their own subsistence needs through agriculture during the rainy season.

### SOME INFERENCES FROM ETHNOGRAPHY ON REGIONAL ECONOMIC ORGANIZATION

There are numerous examples in the Southeast Asian ethnographic record of community-based craft specialization, where a community of independent households produces essentially similar goods for regional consumption. The Kalinga of the Philippines are among the best documented (e.g., Longacre and Skibo 1994; Stark 1991). Even in northeast Thailand today, while copper smelting and bronze casting are no longer undertaken as rural economic pursuits, there are villages where, during the dry season, many or most of the households produce pot-

tery, weave cloth, make mats or other items for extra-village consumption. Similar villages have been widely observed in Southeast Asia (e.g., Keyes 1977:136).

There are two points in particular on which broader regional ethnography is particularly informative for the prehistoric context: (1) Large aggregate cooperative production can develop without becoming centrally administered; and (2) multi-centered, multi-modal, and multi-stage production and exchange systems can effectively distribute goods to all social levels in complex societies, including luxury goods to the elite.

In the discussion above, the archaeological evidence in northeast Thailand was used to suggest a web of metal producers, some concentrated in communities, some dispersed individually in villages, probably undertaking different aspects of the production process. Products ranging from dressed ore to finished manufactured goods could be brought back to the home village for further processing and/or exchange with other villages. This type of flexible organization of production activities in terms of where the different stages of post-mining production take place (e.g., near the mine versus at the village) and by whom (personnel from one village undertaking all or only part of the stages to the finished product) is paralleled by ethnohistoric evidence in iron production in Southeast Asia (Bronson and Charoenwongsa 1986).

Group mining expeditions have been also observed among the Tungei in Papua New Guinea for the exploitation of stone quarries (Burton 1984). Here also most of the products were not finished but traded to the miner's exchange partners as unpolished roughed-out stone axes. Interestingly, from a political point of view, the expeditions, which could take place once every several years and include several hundred men, were not "directed by any central authority but rather were cooperative ventures among members of a so-called egalitarian tribal society." "Social forces" combined with consensus among several clan "big men," rather than a strong controlling individual employing coercive forces, "directed" the mobilization of the work force, and the timing and cooperative discipline of the expedition (Burton 1984:243). It is probably important that the resources being exploited were accessible by numerous individuals simultaneously. Thus the New Guinea stone quarrying system (Burton 1984:237-238) involved numerous work parties organized by subclans who removed the entire face of the deposit combined with short drives, rather than building elaborate gallery systems. A somewhat similar quarrying strategy is in evidence at Phu Lon, based on the condition of the remnant workings.

Group exploitation during the dry season of a spatially nucleated resource has parallels in the recent past in northeast Thailand. During ethnoarchaeological research in the Ban Chiang region in 1979-1981,

White (1982a) was told that parties, usually portions of several households in a village, have traditionally traveled during the dry season to areas closer to the confluence of major tributaries with the Mekong to catch fish and prepare fermented fish sauce. During this season, certain locations have unusual concentrations of fish migrating downstream with the receding waters as the upper reaches of the tributary system dry up. Groups from diverse villages, usually traveling by ox-drawn cart, will congregate for a few weeks to take advantage of this unusual concentration of protein resources before returning to their home base. Very similar dry season fishing expeditions have been described for Cambodia (Delvert 1961:170-174).

Large group exploitation of fish and stone resources suggests possible precedents for cooperative periodic exploitation of a geographically restricted resource prior to the appearance of metal technology. Use of ground stone adzes predates by several millennia the appearance of bronze in Thailand. Established village sites in the alluvial contexts of northeast Thailand are at some distance from stone resources used in manufacturing the ubiquitous prehistoric ground stone adzes. Therefore, the villagers must have obtained adzes or adze raw material from some distance, probably peripheral hilly areas. In addition to the adze production at Phu Lon, lithic workshop sites with remains of adze preforms but no habitation evidence have been identified at other locations along the Mekong and its tributaries (Rutnin 1988; Pautreau et al. 1990). These sites may have had a sporadic pattern of exploitation similar to that proposed for mining sites. Only one quite late prehistoric date of the mid first millennium B.C. is available from the lithic workshop Non Sila (Rutnin 1988), but further work needs to be done to document the antiquity and pattern of exploitation at the lithic workshops.

While lacking proof, it seems that, rather than each individual provisioning him or herself with a stone adze as the need arose, a scenario similar to the New Guinea example occurred whereby parties from a village would periodically visit lithic workshops to provision the village households, conducting preliminary processing at the source. A situation where villages closer to the source develop exchange relationships with villages at greater distances seems highly likely. We therefore propose that "community specialization" existed prior to the appearance of metallurgy—producing and exchanging stone, and probably shell and salt.

Turning to the second area where ethnographic examples may provide appropriate models, there are several studies in the Indo-Pacific region indicating mechanisms and, in some cases, material correlates of widespread exchange occurring without centralized administration or centralized market mechanisms. Some well-documented examples include stone and

pottery in Melanesia (Hughes 1977; Oram 1982), pottery among the Kalinga (e.g., Stark 1992), and textiles in northern Thailand (Bowie 1992). All three examples are from economies where significant amounts of production take place as community-based specialties. While describing these exchange systems in detail is

beyond the scope of this paper, they can provide models of exchange from which hypotheses testable in Thailand's archaeological record could be developed, once archaeologists in the region start collecting and analyzing their data with the detail necessary to address these issues empirically.

## INTENSIFICATION OF COMMUNITY SPECIALIZATION AT PREHISTORIC METAL PRODUCING SITES IN CENTRAL THAILAND

In central Thailand interesting developments occurred that may have emerged from the pattern discussed for the northeast which would represent an intensification (increases in expenditure of energy per production group) and increased nucleation of "community specialization." The Thailand Archaeometallurgy Project is investigating a series of related sites in the Khao Wong Prachan Valley situated in a major metallogenic zone (Pigott and Natapintu 1988a, 1988b; Pigott et al. n.d.; Natapintu 1988, 1991). Unlike the situation in northeast Thailand, all stages and tools of the production process from mining and smelting of ores to casting of ingots and artifacts can be identified within a restricted geographic area along with the habitation areas and cemeteries of the societies involved in the metal production. The copper production debris at the sites of Non Pa Wai and Nil Kham Haeng, the two major production sites excavated, dates between the mid second millennium B.C. and the late first millennium B.C.

### NON PA WAI: A HABITATION AND COPPER SMELTING SITE

Deposits of metal production debris at Non Pa Wai derive from Period 2, dating from the mid second millennium to about 700 B.C. Period 2A is comprised primarily of a cemetery which included several burials with artifacts of a size and shape reminiscent of metal implements described for northeast Thailand: a socketed axe, bivalve molds for casting socketed axes, and a fishhook (Pigott et al. n.d.:5). The overlying Period 2B witnessed some marked changes. The deposit, which spans 5 ha and attains depths of nearly 3 m, consists primarily of copper production debris intermixed with habitation material. The production debris excavated from a highly ashy matrix includes enormous amounts of crushed ore, smelting slag, ceramic crucible fragments (Fig. 13.4) from crucibles much larger than those described for the northeast, furnace chimney fragments (Fig. 13.5), and ceramic molds. The overwhelmingly prevalent genre of mold (in the tens of thousands), termed "cup/conical molds," were

of a size and shape appropriate to cast ingots (Fig. 13.6; Pigott et al. n.d.:9). Less common were bivalve artifact molds (in the hundreds), primarily for implements which for the most part were much smaller and thinner than those described for the northeast or Non Pa Wai Period 2A, or those known from contemporaneous deposits in northeast Thailand (Fig. 13.7). The function for many of these items is not intuitively evident, but incised designs commonly found on the exterior surfaces of the molds have been suggested as marks of ownership (Pigott et al. n.d.).

The absence of evidence for fixed smelting installations suggests to the excavators that again a crucible smelting process was used. Details of the suggested smelting technology can be found in the project publications, but essentially it consisted of a one-step co-smelting of oxidic and sulfidic ores in a crucible overlain by a bonfire of fuel which could have been dry wood. At some later point the crucible was apparently positioned below a portable furnace chimney (diameter about 20 cm) within which fuel was placed. A draft, probably from traditional Southeast Asian piston bellows, was directed through holes in the chimney to maximize temperatures (Pigott et al. n.d.:8). This process is judged technically simple for several reasons: charcoal was not required; the multi-step matte technology normally required by sulfidic ores was avoided; fixed installations were not needed; the ore recipe was not fixed; only copper ingots and artifacts were produced as there is no evidence that tin was locally available or imported for alloying. The Thailand Archaeometallurgy Project sought evidence for functional differentiation in different parts of the site, but instead the evidence revealed a "striking homogeneity" of the industrial deposit (Pigott et al. n.d.:4). This evidence *in toto* indicates a production system in which numerous spatially flexible, small operations were undertaken simultaneously. While there is some habitation evidence intermixed with the Non Pa Wai production deposit in Period 2B, recent excavations at nearby Non Mak La, also by the Thailand Archaeometallurgy Project, suggest that some habitation activity including the cemetery for the period may have been located a few hundred meters away from the main copper production area (Pigott et al. n.d.).

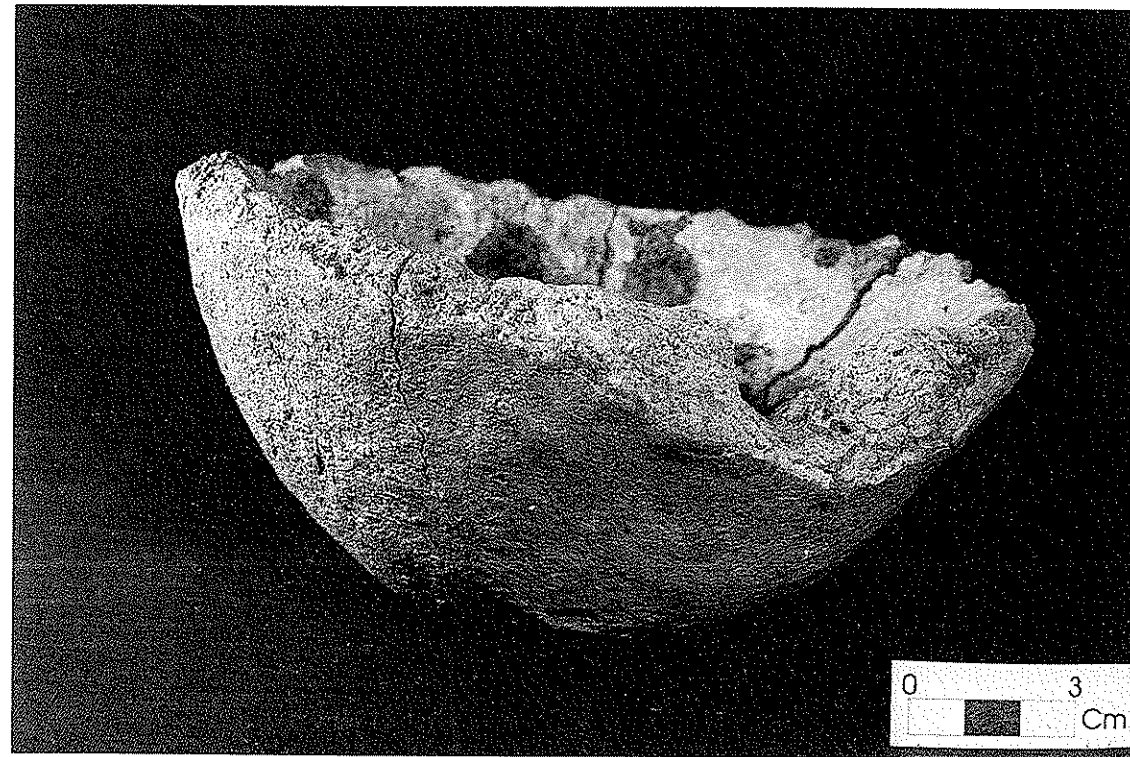


Figure 13.4 A chaff-tempered ceramic copper-smelting crucible from Non Pa Wai (T#16381). This crucible has had its upper edge broken off around the circumference. A pouring spout was also formed by breaking the crucible wall. This reworking of the vessel may have served to make it suitable for melting and casting copper. The smelting crucibles are quite large and do not have pouring spouts.

#### NIL KHAM HAENG: A HABITATION, MORTUARY, ORE PROCESSING, AND SMELTING SITE

Dated between 1100 B.C and 300 B.C., the deposit at the site of Nil Kham Haeng overlaps the latter part of Period 2B at Non Pa Wai and reveals additional details and new developments to the Khao Wong Prachan Valley copper production. While the ongoing overwhelming presence in the deposit (3 ha in area, reaching depths of 6 m) of crushed ore waste, rock, and slag indicates that smelting was a dominant activity, the relative rarity of crucibles and the presence of small, clay-lined pits (about 20 cm across) indicate that smelting may have shifted from crucibles to small bowl furnaces. The portable furnace chimneys became more prevalent and presumably were placed over the bowl furnaces. Since the cup/conical molds for casting ingots are rare, it is not clear if ingots continued as a main product com-



Figure 13.5 A ceramic copper-smelting furnace chimney from Nil Kham Haeng (T#5347).

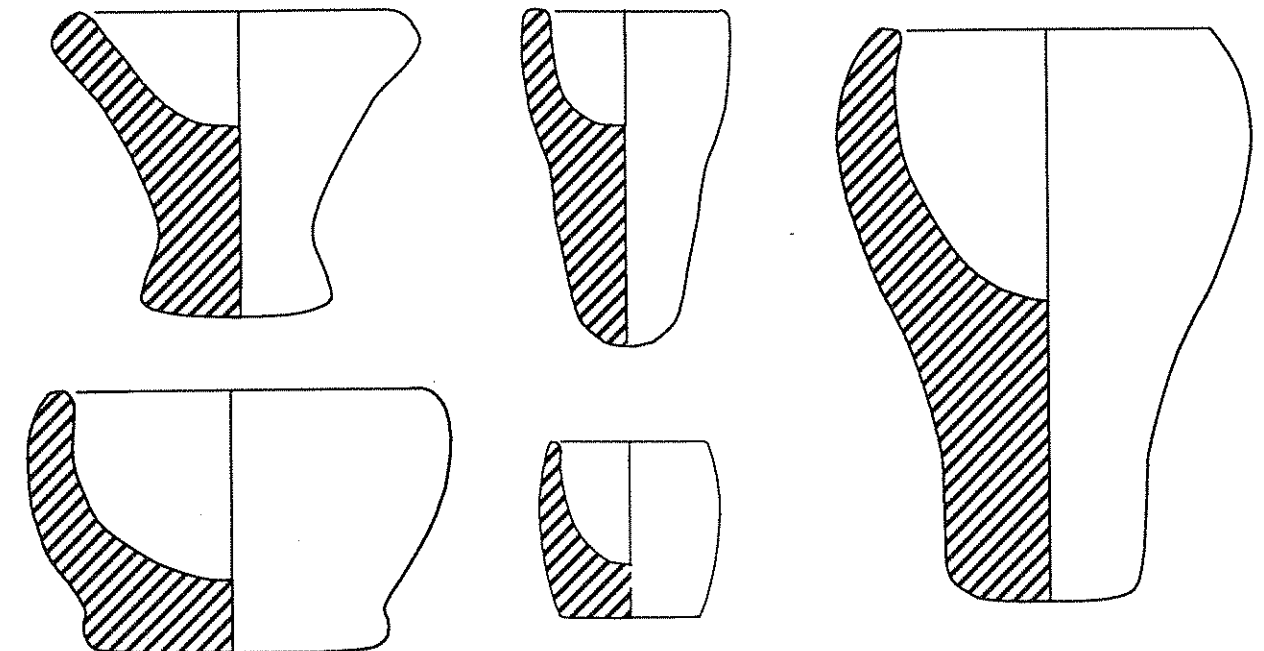


Figure 13.6 A representative selection of ceramic ingot mold types from Khao Wong Prachan Valley sites: (a)–(c) conical molds; (d) and (e) cup molds; (f) shallow mold.



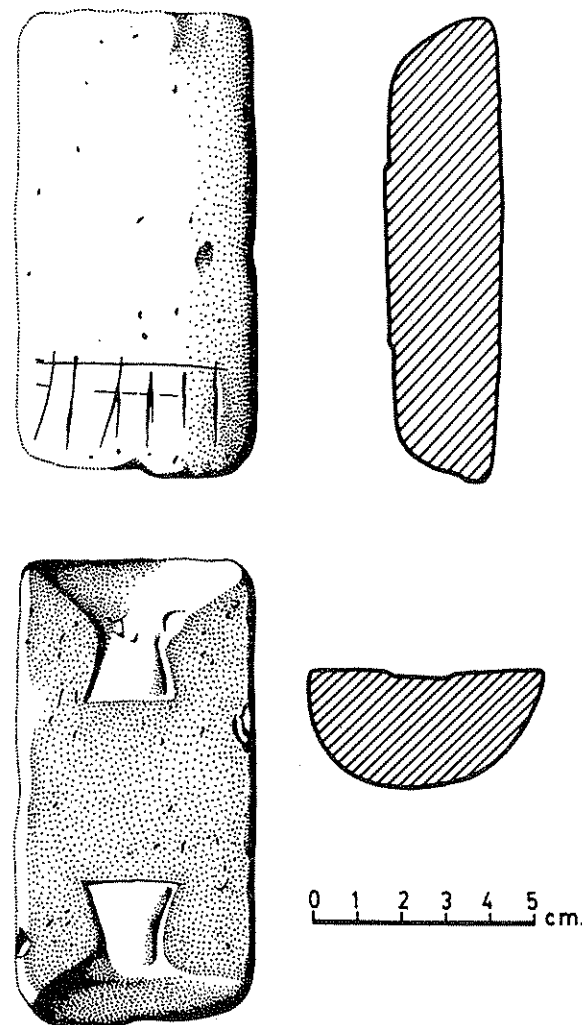


Figure 13.7 A ceramic bivalve mold from Non Pa Wai (T#16570) for the casting of a pair of copper artifacts of unknown function. Note the small scale of the mold and the mold impression. Note also the geometric linear incised patterns on the mold's exterior.



Figure 13.8 A socketed, copper, cordiform implement.

ing out of Nil Kham Haeng, although the metal product derived from the bowl furnace might have served as an ingot. The evidence from the bivalve artifact molds and the copper artifacts excavated from the site's graves indicates that, while the focus on small thin artifacts continues, a single type predominates—a small, thin (about 2 mm) socketed cordiform implement, i.e., a "point" but with a curved, not pointed, tip (Fig. 13.8). The purpose and functionality of these cordiform implements is not at all evident.

The excavators' reconstruction of the production technology (Pigott et al. n.d.) indicates that at some point in the first millennium B.C. lower grade sulfur-rich ores were being exploited that required a significant increase in labor intensity in the processing of the ore. While the quantity of ore and its preparation for smelting probably required increases in labor per unit of output, the associated changes in the material culture can be seen as labor saving, in that the effort involved in fashioning and firing thousands of cup/conical molds and crucibles apparently was

largely eliminated (Pigott et al. n.d.:12). Since the small clay-lined pits were simple to make, and the portable furnace chimneys could be reused numerous times, the smelting process remained simple and production events remained small in scale. As at Non Pa Wai, Nil Kham Haeng revealed no evidence for spatial segregation of copper production activities. It is noteworthy that the fine layering of the crushed gravel at Nil Kham Haeng, a product of water redeposition, has been suggested to support the idea that production remained seasonal.

Another significant difference between Non Pa Wai and Nil Kham Haeng is the clear evidence for sustained and concentrated habitation activity at the later site, including domestic artifacts, abundant faunal remains, postholes for structures, and burials. The Nil Kham Haeng burials show an increase in

range and quantity of artifacts in comparison with second millennium cemeteries in the area. The wealthier graves are likely to have not only pottery, turtle carapaces, carnelian beads, and metal artifacts such as copper and iron bracelets, but metal production equipment such as furnace chimneys, and even raw materials such as the ores (Fig. 13.9). Clusters of as many as 60 of the enigmatic cordiform implements (often miscast) were found in several Nil Kham Haeng burials (Pigott et al. n.d.:14). The spatial separation and different orientations of these graves across the site, and the proportion of graves that contained copper production equipment and products, suggest that mortuary ritual involving these artifacts was fairly widespread and not limited to a tightly restricted segment of society (Pigott et al. n.d.:22).

### INFERENCES FROM THE ARCHAEOLOGY ON THE ORGANIZATION OF PRODUCTION

Examining the Khao Wong Prachan Valley evidence for copper production in light of Costin's discussion, one is struck that although the output and the concentration of effort must have been industrial in scale, there is virtually no evidence to suggest any movement toward workshop organization where unrelated individuals are "employed" in differentiated tasks or toward production units which are attached to or commanded by social or political elites. Continuation of small, independent, kin-based production groups who undertook most of the production steps is indicated by the close association of habitation and production contexts, the lack of evidence for spatial differentiation of activities, and the evidence throughout the central Thai sequence for small production events with seasonal scheduling. The artifacts produced at the central Thai sites remain small implements and ornaments. Technology seems to evolve in concert with the exploitation of lower grade ores, but the production technology remains simple and cheap with only a few developments that might be interpreted as extremely modest increases in capital investment—such as greater emphasis on furnace chimneys. However, the furnace chimney/bowl furnace smelting system also included some labor and capital saving developments and remained at a scale that did not require any pooling of resources beyond the family level. Over all, greater investment was made primarily in labor input, not capital or labor organization. Only slight evidence suggestive of economies of scale can be observed. The larger size-ratio of crucible to mold at Non Pa Wai would allow the casting of numerous artifacts and ingots in comparison with the smaller northeast Thai crucibles which could only hold enough metal to cast a single artifact.

Moreover, there is no evidence for the types of archaeological features that Costin argues would signal attached specialization, such as physical association of attached workshops with administrative structures, or artifactual evidence of administrative activities. "Control—a central concern in attached specialization—will manifest itself archaeologically through architecture and spatial arrangements aimed at segregating production activities and restricting or monitoring the flow of personnel to the facilities" (Costin 1991:27). Instead we find contemporaneous communities,<sup>3</sup> without any obvious physical association with a political center, probably employing related but slightly differing technologies and producing somewhat different products (Bennett 1988; Pigott et al. n.d.). The evidence suggests a regional specialization of essentially peaceful coexisting communities exploiting a massive resource but pursuing slightly different economic strategies. The very volume of the production indicated by the volume of manufacturing debris, and the paucity of the final product recovered from the manufacturing and associated habitation and mortuary contexts, indicates that there must have been significant extra-local demand.

Unfortunately, informative archaeological evidence for the location and nature of the demand for Khao Wong Prachan Valley copper products is virtually absent. As Pigott et al. (n.d.:18) point out, ingots from Non Pa Wai molds have not been reported from archaeological contexts outside of the Khao Wong Prachan valley. Only two examples of the thin bivalve mold cast artifacts have been reported from contexts outside the Valley. Cordiform implements have been recovered from a site 60 km to the north, and a few somewhat related implements were excavated from Nong Nok, a site 100 km to the southeast (C. Higham, pers. comm.) but details of the finds are not yet published.

The Nil Kham Haeng evidence, which indicates a marked emphasis on the manufacture of one relatively standardized artifact type, suggests that, during the first millennium B.C., a significant change occurred, either in demand and/or in the locations for producing different artifact types. Thus, since there apparently was more than one community producing copper simultaneously in the Valley, further archaeological research might demonstrate that different communities were specializing in different products.

While one cannot as yet specify the demand for Nil Kham Haeng products in particular, one can comment on general changes in social context during the mid first millennium B.C. in Thailand. Cemeteries contemporary to Nil Kham Haeng Period 2 (ca. 700–300 B.C.) such as the Middle Period at Ban Chiang document the appearance of iron and a notable increase in material affluence. Settlement data from the Mun drainage system (Fig. 13.1; Welch and



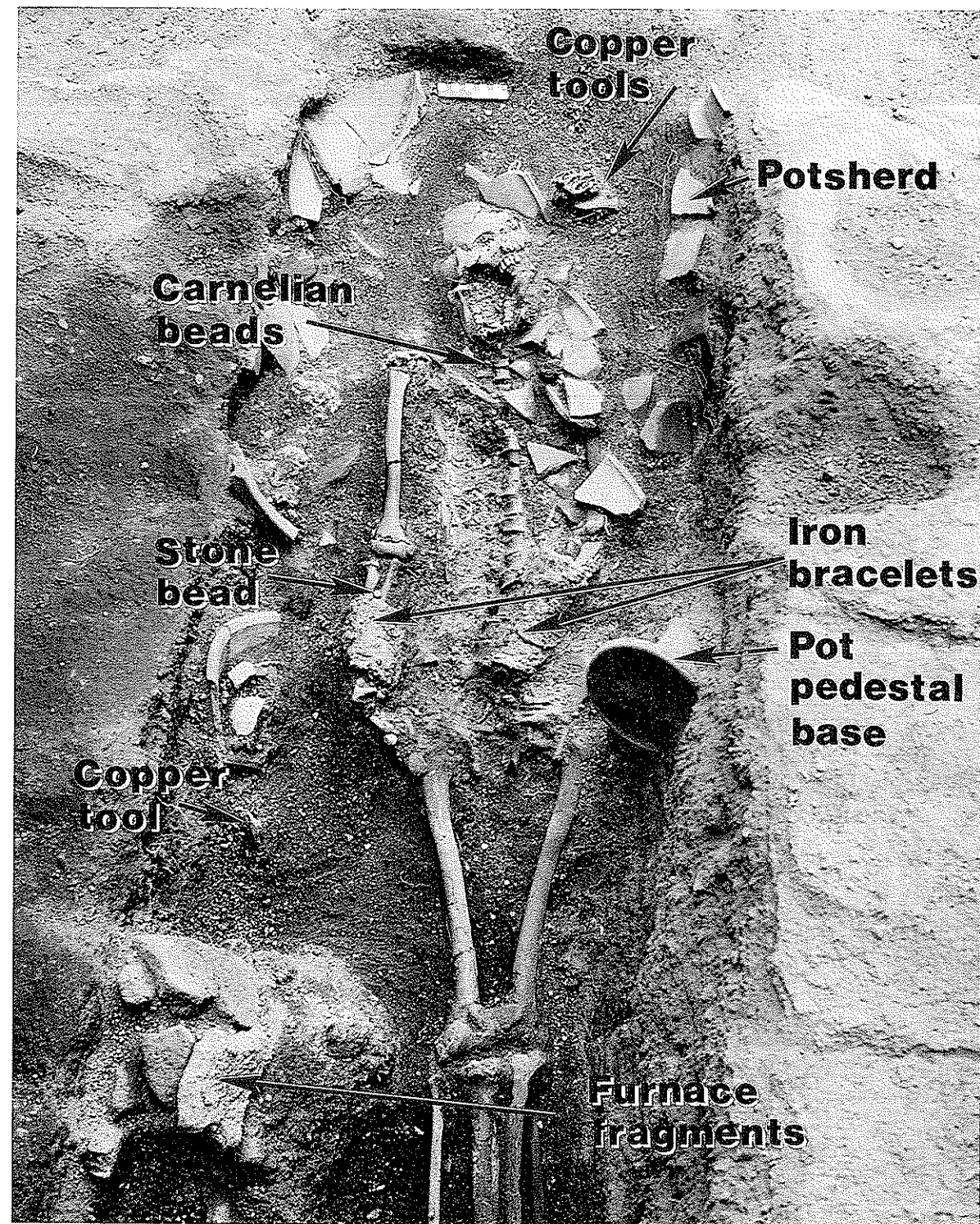


Figure 13.9 Annotated photograph of a Nil Kham Haeng burial (TAP '90, Operation 4, Burial 1) containing various artifacts related to metalworking, e.g., copper cordiform implements, iron bracelets, and fragments of an entire furnace chimney.

McNeill 1991) reveal evidence for agricultural intensification, increases in site size, and the appearance of moats during the Prasat phase (600–200 B.C.). Interpretations of the origins of the use of moats in this region usually stress their role for water retention and agriculture over defense (Moore 1988, 1990). These changes have sometimes been interpreted as documenting the appearance of “chiefdoms” (e.g., Higham 1989b), but this period in Thailand does not seem to be characterized by the clearly demarcated social hierarchy and prominence of warfare commonly associated with the chiefdom “evolutionary stage” (discussed in White 1995a).

While little can be said concerning the details of consumption, the large number and great similarity of the Nil Kham Haeng cordiform implements and molds in themselves suggest standardized production. Costin (1991:33) points out that standardization does not necessarily mean increased control, but may imply greater routinization resulting from economic factors supporting cost cutting strategies—a situation that is in evidence in other aspects of the Nil Kham Haeng data as discussed above.

Pigott et al. (n.d.:14) point out that the cordiform castings must have been so thin that one might question the utility of the objects, which might not have been produced to perform a particular mechanical task. The excavators suggest that such might have been the case, for example, if their shape had primarily symbolic value, perhaps as a special sort of ingot, readily recognizable as to source. Or the objects may have functioned in a “display” role for the expanding civic sectors of society. While much later in time and in a considerably more evolved social context, the Chinese envoy Zhou Daguan’s observations in the thirteenth century A.D. of “gilt bronze ‘arrows’” and other “plaques” decorating

Angkorian civic or religious buildings (discussed in Frédéric 1981:158–159) are suggestive of possible new roles for bronze objects with questionable mechanical capacity.

The archaeological evidence available indicates that, whatever the change in demand was, it was not accompanied by external political controls over the Khao Wong Prachan Valley or its products. Nor is the evidence suggestive that the producers capitalized on this change with a strategy to gain political power beyond the community itself. Aside from the lack of evidence for directly associated administrative structures or artifacts, the keeping and display of the products in funerary rituals suggest that the producers themselves had control over the results of their labor. In fact the Nil Kham Haeng graves indicate that social and economic roles of individuals continue to be very important to attaining social status, as it was in the second millennium B.C. Considering the modest size of Nil Kham Haeng (about 3 ha), the prominence of manufacturing equipment such as furnace chimneys in the graves seems more consistent with relative wealth and recognition for prominent producers at the local community level and less consistent with a true elite accumulating wealth from copper production and using it to finance consolidation of regional political power.

Certainly the identification of archaeological contexts which will shed light on the functional as well as social roles of the copper products from the Khao Wong Prachan Valley is a major issue for future research in Thailand. We may be hampered, however, by sampling error related to depositional processes. The archaeological sample of identifiable artifacts has generally come from grave furniture. Implements or civic items may be more likely to be recycled through remelting and recasting.

#### COMMUNITY-BASED COPPER PRODUCTION IN THAILAND 2000–300 B.C.: SUGGESTIONS FOR AN INTENSIFICATION SEQUENCE

The evidence revealed by the northeast and central Thai data suggests ways that the general concept of “community specialization” may be differentiated along several dimensions. For example, the Thai data suggest that the frequency and volume of output, the size of the consuming region, and the number of stages of production undertaken by producing communities can vary within the broader definition of community specialization. The two poles of community specialization discussed here can be contrasted: the pattern described for the northeast could be termed “community craft” and the pattern described for the Khao Wong Prachan valley, “community industry.”

The available copper production evidence from northeast and central Thailand can be used to pro-

pose a model of economic intensification of specialized production within a community-based model. Such specialization can begin with communities periodically exploiting a nucleated resource, with production to finished artifact possibly occurring in multiple stages in different communities dispersed across the landscape. We have suggested that this scenario is consistent with the second millennium B.C. evidence in northeast Thailand. The central Thai data indicate that intensification can include increased nucleation of activity with some communities making a greater investment in time, capital, and labor by undertaking more of the production stages and at more regular intervals such as annually during the dry season. Further intensification can occur if

contemporaneous communities in close proximity undertake production at comparable levels and intensity that may, however, result in different final products, and/or employ somewhat different technologies—leading to a regional specialization. This model is not meant to be rigid; for example, dispersed production to finished artifact could co-occur with more nucleated production.

The Thai data suggest this entire sequence of economic intensification from periodic community craft to regional specialization occurred several centuries prior to evidence for political centralization. In what kind of social context can this impressive economic intensification without administration occur? Costin (1991:12) suggests that independent specialization can flourish in contexts of "regional . . . peace, or inexpensive modes of transportation, . . . [and] unequal resource distribution," qualities that are supported by the Thai evidence. The evidence for interregional exchange of shell and stone dating from the time of the earliest settled villages in Thailand, the gradual increases in the range and quantity of items of interregional exchange over the period here discussed (e.g., pottery re. Vincent 1988, as well as metals) indicating exchange networks over 100–200 km in dimension, the lack of emphasis on weaponry in metal products or of unambiguous evidence for defensive structures (White 1982b:45; 1988), support not only Costin's proposal. The evidence is also consistent with Brumfiel and Earle's (1987:1) "commercial development model" where "increases in specialization and exchange are seen as an integral part of the spontaneous process of economic growth."

### WHAT HAPPENED AFTER 300 B.C.?

The sociopolitical context in prehistoric Thailand was apparently undergoing significant developments towards the end of the Nil Kham Haeng sequence and the centuries following, although the dating of the appearance of moats and two-tier site hierarchies has not been firmly established. Possibly dating during the second half of the first millennium B.C., these settlement developments are not, however, occurring in close association to known sites of copper production. While some moated sites develop 15–20 km distant from the Khao Wong Prachan valley in the later first millennium B.C., most of the early settlement changes are occurring in the Mun and the Chi drainage systems in northeast Thailand. These locations are not near copper ore sources, and their development seems to be closely associated with considerations initially of water conservation, agricultural intensification, and possibly subsequently the exploitation of salt, timber, and

iron (Moore 1988, 1990; Welch and McNeill 1991), resources that are not highly nucleated or easily "controlled." The presence of "fences" and possibly "ramparts" at some sites dating to the late first millennium B.C. (Nitta 1991) suggests that some level of tension existed in the general region by that time. Nevertheless, one wonders about the degree of tension since among the four adult male burials excavated at one of the late prehistoric Mun Valley sites, not one was buried with any weapons, not even one described as the "bigman" (which did, however, have a rich array of jewelry; Nitta 1991:22). In point of contrast, contemporaneous sites in the Red River Valley have burials rich in weaponry (e.g., Murowchick 1989:308, 430).

While significant exposures of cemeteries associated with these large moated sites dating to the late first millennium B.C. have yet to be undertaken, Ban Chiang Late Period Burials (300 B.C.–A.D. 200) reveal increased variety of grave furnishings with numerous elaborately painted pots and continued prominence of jewelry. While graves vary in their relative richness, so far no set of unusually wealthy graves has been found isolated from a larger, obviously poorer set of graves, hence there is no evidence so far for the formation of a rigidly defined hereditary elite (White 1995a). In sum, one has the sense of many flourishing subregions, each with its own multifaceted internal differentiation. Some flourishing regions, such as the area of Ban Chiang Cultural Tradition sites in the Sakon Nakhon Basin, were outside of major zones where settlement hierarchies more clearly developed.

There is no direct evidence that control by a political elite of either the production or distribution of copper was a direct cause of this burgeoning activity. The presence of late prehistoric small casting installations at modest sites like Ban Na Di suggest that small to average villages could obtain metal and cast for local needs. Jewelry continued to be placed in graves dating to this period and much of it continued to be cast into fairly simple shapes. While the Ban Chiang Late Period graves show bronze jewelry was not ubiquitous, nevertheless the graves in which it was found were not necessarily of outstanding opulence. However, new, more elaborate, and larger types of copper-base jewelry appeared during the period (e.g., a bronze cuff from Ban Don Phlong [Nitta 1991] dated to the equivalent of Ban Chiang Late Period 300 B.C.–A.D. 200). Where were these more elaborate objects cast and how was their production organized? We lack direct detailed evidence of copper production after 300 B.C. but more intensive excavations of the larger sites might show if there were changes from small-scale independent production units in those particular contexts. Investigation of other sites in the Khao Wong Prachan Valley, in the Khao Sai On area to the south, and at the several

other copper deposits (Fig. 13.2) that ring the Khorat Plateau should someday reveal where the late prehistoric copper is coming from, and how its extraction production was organized.

All the evidence considered, the Thai data do not seem to fit Brumfiel and Earle's (1987:3) political or adaptationist models where elites or centralized leadership are either (a) strategically employing specialization and exchange to create and maintain social inequality, strengthen political coalitions, and fund new institutions of control, or (b) effectively managing a critical economic or even a prestige resource—if we look to copper as that resource. If there were activities that elites may have managed or manipulated in the early stages of centralization, it seems unlikely that they included production and distribution of manufactured goods such as copper. Instead, mobilization of labor, in connection with management of water conservation and staple storage to tide over crop shortfalls in years of drought, was the more likely means by which power was initially accrued (D'Altroy 1994:359).

Without going into great detail, the interpretation presented here would be consistent with what historians currently understand of the region's early states of the first millennium A.D. States such as Angkor were greatly concerned with "relations with the cosmos," and the construction of large "reservoirs" were a key symbolic manifestation (van Liere 1980). Leadership was not strictly determined by considerations of lineage, but rather stressed the individual's "prowess" and real life "job performance" (Wolters 1982). Demonstration of diplomatic skills through skilled management of interpersonal relationships (Wolters 1982:18) or negotiating peace or external trade (Hall 1985:191) was critical to successful leaders. Though many wars were recorded, historians do not seem to regard them as the central organizing activity for the early rulers (Wolters 1982:17), or at least peaceful leadership and alliance formation are more frequently stressed (Hall 1985:6, 138). The struggle to control people, and thus manpower, principally through

the formation of political alliances with local landed elite, was the primary concern for rulers according to Hall (1985:4).

From an economic point of view, the states were staple financed, and were concerned primarily with mobilization of basic commodities and natural raw materials through a complex hierarchical-in-theory but decentralized-in-practice temple-based tax/tribute system. Historians agree that political and temple elite were not involved in the direct management of the production of those commodities. As for indigenous goods and the local economies, a system of itinerant and resident merchants "controlled" the inter- and intraregional exchange in a decentralized or perhaps multi-centric manner, which in all likelihood continued to be reliant on regional networks of specialized communities (Hall 1985:171–172, 322, n. 98).<sup>4</sup> Specialized independent communities could provide prestige goods for elite in the form of tribute, even while producing for unrestricted regional consumption, as Bronson and Charoenwongsa (1986:13) document for the nineteenth century Lawa village of Bo Luang in northern Thailand. The merchants, who had some but not outstanding status and wealth, acted as intermediaries between the local economy and Khmer kings by obtaining goods from the indigenous networks. While the elite courts and temples of Angkor had "court artisans," i.e., individual attached specialists, probably primarily for the production of the most prestigious religious and secular goods, elite control of these attached specialists primarily facilitated elite access to inefficiently made luxury items. In the discussions of prestige goods, cloth seems to be mentioned more than metals; it was held in such high esteem that it in fact served as a medium of valuation in Cambodia (Wicks 1992). Overall this elite control over individual attached artisans did not seem to extend to control over an indigenous economic sector or a technology, or to centrally administered state manufacture or distribution of a widely needed product in the early states of the region of concern.

### SUMMARY AND CONCLUSIONS

This paper has reviewed evidence for copper production in prehistoric Thailand and found that the evidence supports a community-based model for production organization from 2000–300 B.C. This community-based production showed intensification resulting in a region of specialized production communities at least by the early first millennium B.C. prior to any evidence for the development of political centralization. Current evidence suggests that community-based specialization continued into

the period of state formation, and indeed, continues to the present.

The implications of a strong economic basis in community-based specialization as characterizing a pre-state economy has not yet been addressed in theories of the development of social complexity. The Thai data indicate that even the presence of industrial levels of activity need not correlate with over-arching production controls or pronounced levels of social complexity among the producers.



Philip de Barros (1988) has identified a possibly analogous context in terms of iron production among the Bassar people in northern Togo, West Africa. From the late first millennium A.D. down to the nineteenth century, de Barros (1988:91) has argued that the success of the industry led to "higher population densities, larger and more stable communities, a more aggregated settlement pattern in the ore zone and increased craft specialization and trade." Nevertheless, it did "not necessarily result in a significant increase in the degree of political centralization."

At the very least, strong development of specialized communities and decentralized exchange of their products prior to political centralization would create an unlikely environment for elites to try to control as a means to accumulate power. "Controlling" such an economy would seem to require considerable coercive force and great investment in administrative apparatus to bring production and distribution under regulation. There is no evidence among the early states in the region for this type of investment. Indeed Brumfiel and Earle (1987:1) have argued that "cases of social complexity *originating* through commercial development must be relatively few." The Southeast Asian data indicate the wisdom in separating the concept of social complexity from the concept of political centralization. The pre-state economy in the core Southeast Asian region does seem to have developed specializations and interregional exchange, but the evidence does not support that this production and exchange activity was the basis for *political* centralization. On the other hand, society seems to have become more differentiated and complex, but not necessarily along rigidly hierarchical lines. Instead White (1995a) has proposed that a heterarchical model of social complexity be applied to this region, in which lateral differentiation and flexible hierarchy were core social processes. Economic specialization and interregional exchange served to integrate that differentiated society horizontally (see also Kennedy 1978).

Undoubtedly the trajectory to state formation in a region whose pre-state context is characterized by developed community-based production systems, decentralized distribution, and social heterarchy will have characteristics and developments that differ from regions with clear evidence for development of rigid hierarchies and elite controls over economic sectors. Sure enough, the historians tell us of the extraordinary flexibility in leadership generation, the lack of standardization in such areas as valuation concepts (Wicks 1992:63), and the core process of localization repeatedly evident in the incorporation and transformation of ideas, concepts, and practices (Wicks 1992:314; Wolters 1982). The prehistoric record is beginning to reveal that roots of these very

processes extend back for over 2000 years prior to the establishment of states.

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#### NOTES

1. Data mentioned from the site of Ban Chiang derive from the joint excavations by the University of Pennsylvania Museum and the Fine Arts Department of Thailand (Penn/FAD) in the mid 1970s. Data from Phu Lon, Non Pa Wai, Nil Kham Haeng, and Non Mak La derive from the joint Penn/FAD excavations in 1984, 1986, 1990, 1992, and 1994.
2. For the purposes of this discussion we will assume that the known inventory of copper-base artifacts generally reflects the range and proportional production of particular artifact classes. One might argue that jewelry is vastly overrepresented due to its relative prominence in grave contexts. Utilitarian implements and weapons might be vastly underrepresented and perhaps were less likely to be recovered in grave contexts because they were "lost," "used up," or recycled by recasting. However, this argument is thrown into question by excavations of prehistoric sites in the Red River Valley. Sites there have yielded much higher proportions of bronze weapons and tools such as spearpoints and adzes starting from the second millennium B.C., even among grave goods (Murowchick 1988, 1989; Ha Van Tan 1980; Ha Van Phung and Nguyen Duy Ty 1982). Bronze jewelry is much less frequently mentioned.
3. In fact, another set of sites with similar evidence for metal production has been identified about 30 km south of the Khao Wong Prachan Valley metal producing sites in a locale known as Khao Sai On (Ciarla 1992:125-126).
4. While there has been little archaeological research to document empirically the economy of the early historic period when states formed, excavations at Ban Di Lung in Lopburi Province (Suchitta 1987) demonstrate the continuation of community-based metal production, in this case iron, in the sixth century A.D.

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