CERAMIC TECHNOLOGY IN THAILAND

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INTRODUCTION

Pottery has traditionally been employed by archaeologists to construct "cultural histories" using perceived similarities and differences in styles. It is unfortunate when this is the principal means of classification because it can, and often has, led to erroneous conclusions. Until quite recently archaeologists working in Southeast Asian contexts have been assiduous in following this practice, once common in American and European studies (Bayard 1970, 1971, 1976, 1977, 1979, 1980; Bronson 1976; Higham 1972, 1977). An additional problem is that the Wheat-Gifford "type-variety" system (Wheat *et al.* 1958; Gifford 1960), which has become institutionalised in Mesoamerican research (Jones 1986:89), is still adhered to by many Southeast Asian workers, (for example Welch 1985; Wilen 1987; and in particular Bayard 1984a, 1984b, 1987 and 1988). If we are to trace and order the areal distribution of prehistoric pottery accurately it is crucial that we first establish where it was made. As Higham (1989:102) has noted with respect to the Non Nok Tha funerary pottery, which is by far the largest such assemblage from Northeast Thailand:

> As is the case for nearly all Southeast Asian sites, we will not know how many, if any, of these were locally made or were exotic to the area until a petrographic analysis of the fabric has been undertaken.

The major difficulty with the Wheat-Gifford system is that it places a disproportionate emphasis on pottery forms at the expense of technological factors. Ceramic fabrics in particular are treated ambiguously. We need not concern ourselves with the details of this system except to note that it follows the American mentalist concept of ceramic types or attributes as representing mental templates of the potter (Gillen 1938:27; Arnold 1985:5-19). As Arnold has observed, both the "potter's mental template" and the "archaeologists ceramic type" definitions originated in the 1920s and 1930s, "and these concepts are still important in American archaeology" (Arnold 1985:7). They are also apparent in most Southeast Asian studies. Southeast Asian archaeologists are fortunate, however, because

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ceramic research in this region is in its infancy and we can therefore learn from the experience of specialists elsewhere.

In this paper I argue for the inclusion of more than stylistic criteria in determining pottery types. We apparently have no difficulty in recognizing stone, bronze and iron artefacts, and accept Thomsen's use of these materials to construct his famous Three Age System (Graslund 1987:17-29). If we are to order and classify ceramic artefacts accurately, the materials from which they were manufactured must be taken into account. In my view it is axiomatic that a ceramic type be defined in terms of both form and fabric. Form can usually be defined as shape, texture, colour and surface finish, but may also include any other variable which reflects the forming and/or finishing processes. Fabric (paste is often the preferred American term) is the material from which the ceramic artefact was manufactured.

Consensus on the form-plus-fabric definition of a ceramic type has already been reached in Europe (Hultèn 1974:7). This has allowed a unified methodological and theoretical approach. Yet consensus and clarification were absent less than two decades ago (Peacock 1970:380-389). European consensus has resulted in rewarding advances in ceramic investigations (Hultèn 1977; Howard and Morris 1981; Freestone *et al.* 1982) undertaken within this prescriptive scientific paradigm (Kuhn 1962, 1963). Unfortunately the European experience has not been replicated in North America or Mesoamerica. The mentalist approach (Arnold 1985:4-12), with its style-oriented emphasis, has continued to dominate research in the Americas in spite of attempts to inculcate the kind of technological methods espoused by Shepard (1956) and others (e.g. Porter 1964). An absence of such consensus in Southeast Asia makes the urgent need for the adoption of a standardised terminology that is both precise and appropriate seem obvious.

At present, several important Southeast Asian issues are being discussed on the basis of ceramic evidence. Relative chronologies, for example, continue to require considerable attention. Without consensus on such topics we can have little confidence in making meaningful progress. As Kuhn (1963:351) observed, consensus allows scientific communities to "take the foundation of their field for granted". In this paper I will argue that we must include technological data in our pottery typologies if valid conclusions are to be achieved.

Within the "Wheat-Gifford" paradigm ceramic studies generally either omit or emphasize only superficial technological aspects of pottery fabrics. Technological "attributes" are typically encompassed in a broad category labelled "general technology", which together with surface treatment and vessel form (or "design style") comprise "a class of pottery" (cf.Wheat *et al.* 1958:34-46). This is unfortunate because, without a petrographic analysis of the fabrics involved, the origins of these wares are unknown. Without this information many assumptions which depend on provenience will be invalidated. Ceramic style distributions, for example, are often assumed by style analysts to reflect regional culture histories. These distributions may, however, result not from culture histories *sensu stricto*, but from changing patterns of trade and exchange (Arnold 1985; Vincent 1988). Similarly, the value of funerary wares is dependent on whether the

assemblage is wholly or partly exotic, with imports usually being accorded greater value than locally produced pottery (Dalton 1975:84; Lamberg-Karlovsky 1975:363; Higham and Kijngam 1984:714).

Technological studies can not only provide evidence helpful in sourcing pottery, but also data critical in the characterisation of discrete potting traditions. Changes in potting clay preparation, for example, allow clear divisions to be made between traditions in terms of their different technological practices. We can be confident that such changes are meaningful because potters are extremely conservative in technological matters.

DISCUSSION

Several potting clay preparation techniques are evident in prehistoric Thailand. These can be subdivided into two major groups on the basis of natural or artificial tempers which have been added to improve the potting clay. It is feasible to manufacture ceramics successfully directly from quarried clay, but such clays are rare and most require modification for use in potting. Locally available materials are usually favoured for temper, either in an "as received" condition or modified in some manner by the potter. Where natural deposits of, for example, sand are readily obtainable these are often exploited. In some sedimentary zones, however, suitable natural tempering materials may often be lacking. The extent of these zones varies from region to region. Many prehistoric manufactories are likely to have been located in sedimentary terrain for two important reasons. First, sedimentary terrain is estimated to form up to 80% of the earth's crust. Second, prehistoric settlements tend to be concentrated in such terrain for socio-economic reasons unrelated to pottery factors.

Two methods of characterising pottery fabrics are available to ceramicists (Vincent 1988). The traditional method follows Anna Shepard's pioneering study of Rio Grande potteries and involves identifying mineral inclusions in thin sections and other standard geological techniques. Examination of both modern and prehistoric wares from manufactories and archaeological sites within the Khorat Plateau has resulted in the development of a new technique which can be used in tandem with the mineralogical method. This latter method involves identifying manufactured inclusions in fabrics. It thus provides detailed evidence which relates directly to aspects of ceramic technology. In this case ethnographic research in Northeast Thailand provided unequivocal data crucial in understanding the technological processes involved in preparing the raw clay for use in the prehistoric pottery. In some instances where rice by-products are involved the method also allows inferences to be drawn about subsistence strategies.

Provided the study area geology is distinctive the mineralogical method can suggest likely sources of pottery manufacture. If exchange networks are involved this information can prove crucial in, for example, the construction of relative chronologies. Many other factors are, of course, also involved. These may include identifying production centres and, when potting accoutrements are manufactured from ceramic materials, the presence of migrant potters.

Potting is sensitive to environmental and technological factors. Clay quality, temper availability and ceramic technology interact to constrain or enhance pottery manufacture. Potting clays are usually confined to small localized deposits. These are unevenly distributed as a result of variations in the regional disposition of geological structures, as well as the processes of weathering, transportation and deposition of detritus from such strata. Potting clay quality varies from poor to excellent and most clays require modification through the addition of temper to improve drying and firing characteristics. Without temper such clays are unsuitable for potting. Temper is therefore a critical additive

Potters are technically conservative partly because their craft involves complex processes. Lauer (1974), for example, reports that Amphlett Island potters, who had no knowledge of tempering, boycotted their traditional clay source for economic reasons. This source was replaced with new but inferior clay which required tempering. Their pottery deteriorated dramatically because, tradition-bound, they failed to adapt. The impasse was only resolved when the traditional source again became economic to import. Production was then resumed in the established way with the preferred potting clay.

Any change in temper is potentially significant. Craft potters require ready access to either natural or manufactured tempers. Rice, grog or sand are common tempering materials in Southeast Asia. The manufacture of grog suggests an adaptation to sedimentary terrain lacking suitable alternatives. This response requires extra effort and resources. Once adopted, however, the grog tempering method provides a degree of resource independence and this further reinforces the potter's conservatism. It is particularly significant when one grog tradition is replaced by another because no functional requirement would dictate such a change. Sand tempers are more likely to be exploited in riverine, lacustrine and coastal regions or where other natural deposits occur.

The technological method, by defining different ceramic materials, helps characterise and identify potting traditions. If the spatial distribution of distinctive potting methods is discrete it seems reasonable to infer that each tradition was mutually isolated. This kind of information can be used both synchronically and diachronically in much the same manner as we conceive of Thomsen's Stone, Bronze and Iron Ages. Although these latter categories were developed to order relative chronologies, two key aspects of the classification method are relevant. The first involves comparing the physical properties of artefacts, and the second an analysis of their spatial relationships (Gräslund 1987). This concept is followed here when comparisons of different ceramic traditions are used to order chronological sequences.

One ingenious response to a local lack of suitable tempering material is to manufacture temper from the raw clay itself. We have noted that once adopted, this strategy affords the potter a considerable degree of independence from the constraints of a local paucity of suitable raw resources, which further reinforces their inherent conservatism. Such prepared temper, or "grog", occurs as two distinctive variants. This has important implications.

One variety of grog is simply fired clay crushed into particles about 2 to 3 mm in diameter. In some instances the particles were probably passed through a sieve. Such orthodox grog has been identified in Thailand from many sites within the Khorat Plateau, the Central Highlands and at Khok Phanom Di (Vincent 1987, 1988). Another grog requires a more complex manufacturing process which involves making hand-sized balls of clay mixed with rice husk and chaff which are crushed after firing on a bonfire. Because of its diagnostic appearance and morphological similarity with inclusions in some minerals this variety of grog is termed "blebs" (Vincent 1984, 1988). At Ban Na Di, blebs superceded orthodox grog mid-way through the sequence. Differences in raw material resources would not dictate such a change because either grog would function in an identical manner as a temper. Further, as bleb temper requires more effort and material, the change was not for economic reasons.

The replacement of one grog tradition by another is significant for two important reasons. First, no functional requirement would dictate such a change. Any change in the face of an established successful method, which was unnecessary for technical reasons, is clearly the result of non-technological factors. Second, in the bleb temper example, the magnitude of the technical change is increased because bleb temper manufacture is more complicated due to the inclusion of additional material. Technical conservatism would militate against the adoption of a more complicated method in opposition to a simpler, proven, procedure. Thus such changes suggest the influence of one ceramic tradition, and *ipso facto* one culture, upon another.

At Ban Na Di the initial orthodox grog ceramic tradition was replaced by one producing bleb tempered wares *c.*100 BC. Associated with the bleb temper tradition are many new ceramic artefact forms and different construction methods. Burial ritual (Higham and Kijngam 1984) and metallurgy (Kijngam 1984:91) also changed. When such evidence synchronises in this manner, cultural changes of some magnitude are indicated. Their impact is reflected in a major shift in the foci of external relationships at Ban Na Di. In terms of the Ban Na Di ceramic spectrum, exchange networks were concentrated in the Sakon Nakhon Basin prior to *c.*100 BC, but relationships with Khorat Basin sites were gradually increasing during the 1st millennium BC. Coincident with the establishment of the new bleb temper industry, a vigorous and considerably expanded exchange network was opened up with the much larger and strategically situated Khorat Basin. Yet the presence of exotic crucible fabrics suggests that links with an eastern Sakon Nakhon Basin bronze industry network were still maintained.

Exotic items such as cylinder seals and glass beads also made their first appearance in association with the new ceramic technology. These changes suggest that the Sakon Nakhon Basin network was incorporated into a much larger exchange system which stretched far beyond the Khorat Plateau. It is possible to trace the spread of the distinctive bleb-temper ceramic technology from south to north during the 2nd and 1st millennia BC. It is present in the Bang Pakong Valley ceramic spectrum *c.*2,000-1,500 BC, at Khok Charoen *c.*1,500-900 BC, at Phimai *c.*1,000-600 BC, at Ban Chiang Hian *c.*1,300-600 BC, at Non Nok Tha *c.*900-600 BC, and at Non Chai *c.*400 BC-AD 200. At Ban Na Di

it first occurred *c.*100 BC and the Sakon Nakhon Basin ceramic spectrum shows that bleb-tempered wares then became common to the region[1].

The implications of these changes in the areal distribution of potting technologies are twofold. Firstly, prior to the introduction of the bleb-tempering tradition, regions to the north of the Central Plain, which contains the Bang Pakong Valley, can be characterised as displaying a marked variation in potting technology. This variation is evident in a wide range of differing clay preparation methods including the use of sand, grog and rice tempers. Finally, following their initial introduction into the Khorat Plateau, the distribution of bleb-tempered wares increased extensively and many local traditions adopted the new technology. These changes are correlated with clear evidence for expanded exchange networks and the rise of stratified societies in the region (Bayard 1984a; Vincent 1988).

To conclude, I hope that this paper has shown that the technological analysis of pottery can provide key information crucial to an understanding of early cultural developments in Southeast Asia.

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FOOTNOTE

1 Watson *et al.* 1986 report grog and rice in association in Period III fabric 5 at Khok Charoen. This is taken to be diagnostic of bleb temper. Thin-sections of this fabric have also been examined by me. The Phimai fabrics have not been thin-sectioned and in this case Welch's (1985:194,199, 203, 232-235 and Appendix B) hand specimen description "chaff with grog" has been relied on. All other fabrics have been examined in thin-section by me, including Non Nok Tha Phase, Non Chai Phase 1-4 and Ban Na Di Mortuary Phase 2 fabrics. Pottery from 32 Sakon Nakhon Basin, 8 Khorat Basin, 8 Central Highland sites and Khok Phanom Di has been considered petrographically. It should be noted that data from many sites have not been included, either because they are peripheral or because of incomplete reporting.

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