

## BAN CHIANG AND CHARCOAL IN HYPOTHETICAL HINDSIGHT

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The site of Ban Chiang was excavated by a joint project of the Thai Fine Arts Department and The University Museum of the University of Pennsylvania (hereafter PENN/FAD) under the direction of Pisit Charoenwongsa and Chester Gorman in 1974 and 1975. The relative and absolute chronologies which until recently had been presented in preliminary format only (Gorman and Charoenwongsa 1976, 1978; Hurst and Lawn 1984; White 1982; Bronson and White 1984) have now been revised (Table 1). Readers interested in the full data and argument are referred to White (1986). This article presents one portion of the argument which the author hopes will stimulate both discussion and increased awareness by excavators of some of the complexities in radiocarbon dating using charcoal from sites in this region.

### BACKGROUND TO THE PROBLEM

The dating of the Ban Chiang sequence has been a major controversy among not only Southeast Asian archaeologists, but among prehistorians specializing in other parts of the Old World as well. Considering the history of problems in developing a chronology for the site, and the tragically premature death of the co-director, Chester Gorman, one might conclude that a full chronology for the PENN/FAD excavations at Ban Chiang was unsalvageable and that resolution of chronological issues raised by the site must await future excavations at related sites.

Clearly many dating issues will fade only through the eventual development of regional chronologies based on carefully articulated sequences from several individual sites. In the meantime so few sites have been excavated (and even fewer of these have fully published chronologies) that the chronological evidence from each individual site is critical, because at the present time large portions of the regional chronology may be based on a single site.

Ban Chiang, whose deposits span 3000-4000 years including pre-metal, bronze-bearing and iron-bearing periods, presents the most comprehensive prehistoric sequence of any site yet excavated in northeast Thailand. In view of the importance of the site to scholars within and outside of the region, interpretation of the extant absolute dating evidence deserves serious effort despite its problems, even if reinterpretations may be necessary in the light of future evidence.

If interpretation of the chronological evidence for Ban Chiang were a straightforward task, a detailed presentation would have

appeared long ago. Instead, the tardiness of full presentation of the Ban Chiang chronological evidence reflects interpretive difficulties in the archaeology of the site. As presented in White (1986), the relative chronology of Ban Chiang is based on a meager amount of soil stratigraphy and a detailed examination of burial ceramics and their sequential relationships. Integrating such a sequence with a series of charcoal-derived dates presents particular interpretive problems and these difficulties help to account for the many conflicting chronological interpretations which have appeared on the site. Ideally, preferred methods for dating the burial sequence might be thermoluminescence, bone apatite, or collagen, because they could be applied directly to items which are stratigraphically unambiguous, e.g. contents of burials. However, at the time of the Ban Chiang excavations all of these methods had produced questionable results in the region: TL with Ban Chiang pottery, and bone dates with Non Nok Tha specimens (Loofs 1974; Bayard 1979:22-23).

At the time of the Ban Chiang excavation, charcoal probably seemed most likely to produce reliable dates from a technical point of view. The problem, particularly in a site lacking detailed soil stratigraphy, is to relate the charcoal specimens to what one wants to date, i.e. in the case of Ban Chiang, mainly pottery types found in burials. Thus, 33 charcoal specimens were tested at the Radiocarbon Laboratory of the University of Pennsylvania (Hurst and Lawn 1984). The results of these tests form the basis for the absolute dating of the Ban Chiang sequence at this time. This discussion will address general issues of provenience and the interpretive approach employed with the Ban Chiang radiocarbon samples. Those interested in the provenience and interpretation of individual dates should see White (1986).

#### CHARCOAL DATES FROM PREHISTORIC SITES IN NORTHEAST THAILAND

In a critique of previous chronologies of northeastern Thai sites, Higham (1984:231) has argued that "all radio-carbon samples must come from in situ contexts such as hearths, charcoal from within bronze casting furnaces, or wood cut from prehistoric coffins. Charcoal removed from the matrix of grave fill, or scattered charcoal collected from a given layer is valueless. The stratigraphic relationship of the sample to the event being dated must therefore be demonstrated and if necessary, expressed as a terminus ante or post quem."

These standards may at first appear impeccable, even obvious, and certainly the dating of sites in the region needs, and will continue to need, rigorous detailed evaluation. However, implementing these standards, despite their desirability, may not be straightforward or even necessarily feasible if archaeologists have to rely on charcoal dates for their sequences. Two reasons for the difficulty in implementing these standards include: (a) charcoal deposits which meet Higham's definition of in situ often do not exist in relevant sites in sufficient quantity and distribution to serve as

an adequate dating framework; and (b) there can be significant problems in accurately relating stratigraphically these in situ charcoal deposits to cultural sequences.

The fact is that many of the important prehistoric sites thus far excavated in Thailand have not been blessed with many indisputable hearths, kilns, or wooden coffins (e.g. Ban Chiang, Ban Kao, Non Nok Tha, Khok Charoen to name a few; an apparent exception is Ban Na Di excavated by Higham and Kijngam 1984). Even when possible hearths can be identified, their true stratigraphic position relative to the cultural phenomena the archaeologist is trying to date, such as a burial sequence, can be very difficult to determine with any specificity in the absence of detailed soil stratigraphy. Furthermore, as argued below, ethnographic evidence suggests that archaeologists cannot assume that charcoal lenses which appear to be possible hearths were necessarily built at ground level.

Thus, limiting dating of Southeast Asian sequences to hearths and kilns may be impractical and even potentially deceptive for regional prehistorians at this early stage in the development of regional chronology. The author seeks to demonstrate that basing the Ban Chiang chronology solely on "hearth" dates would not only result in a deficient dating framework, but potentially an erroneous one as well. Moreover one may doubt that prehistorians from more extensively excavated parts of the world would restrict their interpretations to the sources advocated by Higham, even though such sources might be preferable or carry more weight.

We will now examine where charcoal was found in Ban Chiang deposits in order to understand the dating options available to the excavators. The following discussion will be organized around three topics: What contexts at Ban Chiang yielded charcoal? Using an ethnographic model, what might have been the likely sources and depositional processes for charcoal in the deposit? What are the resultant implications from the first two topics for dating Ban Chiang and possibly other sites with similar depositional processes?

#### CHARCOAL DEPOSITS AT BAN CHIANG

As charcoal was excavated during the two excavation seasons at Ban Chiang (1974 and 1975 referred to as BC and BCES respectively), the specimen was recorded in a C14 Register. The C14 Registers for BC and BCES give a broad picture of the contexts in which charcoal was found. The BC C14 Register lists 33 samples. Of these 28 were considered associated with burials at the time of excavation, 3 were from a general excavation layer, one came from inside a large pot, and one allegedly was from a hearth area. An additional BC specimen not listed in this Register came from inside a pot.

The BCES C14 Register lists over 650 charcoal samples.

According to the Register, 54% of the samples came from the general soil matrix, either as localized specimens or as charcoal collected during the excavation of a layer. Twenty-four percent of the BCES specimens were considered associated with burials. Twenty percent were excavated in association with features such as postholes, sherd or bone scatters, pits, etc. Eight specimens were listed as derived from possible hearths, but only one of these came from prehistoric levels (although see below for further discussion of other possible hearth-related features in the prehistoric deposit).

Various preliminary observations are evident from the listings in the two C14 Registers. Most apparent is the recovery of many more charcoal specimens during the BCES season than during the BC season. The reasons for this are not entirely clear, but it may reflect one or more of the following: (a) greater effort during the BCES season to collect smaller or dispersed samples particularly from the general soil matrix, which would be consistent with the generally higher caliber of data collection during the second excavation season; (b) differences in conditions for preservation between the two locales which is suggested by generally better preservation at BCES; and (c) differences in prehistoric utilization of the two locales resulting in greater deposition of charcoal at BCES. Impressionistically, there does appear to be a lower density of postholes and sherdage in BC which might indicate a lower intensity or different type of prehistoric habitation activity in comparison with BCES.

Although not systematically recorded in the C14 Registers, one general point about the charcoal specimens recovered is that samples tended to be small. This greatly limited the number of specimens which actually could be dated. For example, even though all 34 samples recovered from BC were submitted to the Pennsylvania Radiocarbon Laboratory, 17 of these were judged too small to be run by the methods available at that time (1975) at that Lab. It is likely that an even higher proportion of BCES samples would have been considered too small to run individually. Twenty of the 33 dated Ban Chiang specimens had to be run in the small one liter counter (Hurst and Lawn 1984). In a couple of cases, more than one specimen was combined to accrue sufficient mass for an individual sample run.

The 355 charcoal samples collected from the general soil matrix in BCES can be placed into one of two broad categories based on comments in the excavation records. (1) Over half consisted of charcoal fragments collected within a single excavation layer. Each sample was usually collected not from an entire layer, but from within a single quadrant within a square (an area of less than 4 square meters). (2) The remaining samples were collected as isolated individual charcoal fragments.

Turning to feature-associated charcoal, C14 specimens excavated in association with a burial are the most common context in BC and the second most common in BCES after general provenience charcoal. However, the nature of the association of charcoal with burials at

either site is not always clear from the records. On occasion the records do indicate that the charcoal was found in a grave vessel, grave fill, or in close proximity to the skeleton. Even though the BC excavation was not of the same caliber as BCES, it seems unlikely that the excavators would have systematically ignored charcoal not associated with burials had it been comparable in size and amount to that associated with burials. Repeated association of charcoal with BC burials, therefore, is suggestive that some of the charcoal samples excavated with Ban Chiang burials may have been deposited contemporaneously. This possibility is further addressed below.

A final general point about the Ban Chiang charcoal samples is the noteworthy paucity of hearth-derived charcoal from prehistoric contexts entered in the C14 Registers for both seasons (i.e. for each locale only one specimen from prehistoric levels was listed as hearth-derived). However, an examination of other excavation records (e.g. plans and square notes) revealed a few other possible hearth-related deposits which were not listed as such in the C14 Registers.

In view of Higham's (1984) emphasis on in situ charcoal deposits, we will now turn to a more detailed examination of potentially in situ charcoal deposits at Ban Chiang. The following topics will be addressed: What potentially in situ charcoal deposits were found at Ban Chiang? Can their stratigraphic position relative to the cultural sequence be identified? Can these deposits hypothetically serve as a sufficient basis to develop a dating framework for the site?

#### Potentially In Situ Charcoal Deposits

The phrase "In situ charcoal deposits" will in this section refer to charcoal which has been deposited at the location where a deliberate and confined fire-producing activity took place (such as hearths, kilns, etc.). Of course, other events can lead to in situ deposition of charcoal, such as house burnings, land clearing, etc., but evidence for these will not be discussed here. Following thorough examination of layer plans and notes the author found several additional possibly in situ prehistoric charcoal deposits beyond the two prehistoric hearths mentioned in the C14 Registers. Most were limited charcoal concentrations which were noted on the plans and either given a feature number and/or suggested as possible hearths. Some but not all of these concentrations are listed in the C14 Register simply as features. Those concentrations noted on the plans but not specifically mentioned in the C14 Registers may have been collected in general layer samples.

We shall now examine in more detail charcoal deposits from the PENN/FAD excavations at Ban Chiang that might be hearth or kiln related. Given the ambiguity in hearth identifications at the site, any significant charcoal concentration needs to be examined as a possible hearth deposit. The records disclosed ten non-burial features of potential interest.

### Ten Non-Burial Charcoal Concentrations or Possible Hearths

Three possible hearth-related deposits came from BC:

- (i) A circular area about 20 cms in diameter is described as "a charcoal filled hole of some sort". The feature is not clearly attributable to a habitation horizon. The author estimates from the context that the charcoal could have been deposited as late as EP V, and as early as EP II.
- (ii) A feature of about 1.5 meters square with distinctive soil color and texture changes, charcoal fragments and broken pottery. The notes sometimes refer to the locale as a "hearth", and also call it "baffling". Although the notes suggest a connection with adjacent postholes, they also suggest connections with overlying features. The author concluded that the charcoal could have been deposited before, during, or after EP II.
- (iii) A "hearth-very hard fill" is indicated for a circular area 50 cm in diameter, although no associated charcoal seems to have been found. Although postholes appear in the layer, patterns of intercutting suggest that they may derive from more than one habitation phase. With respect to the burial sequence, based on depth one can only conclude that the presumed hearth seems to have been deposited sometime during the Early Period prior to EP IV.

Seven features with a concentration of charcoal were found in BCES prehistoric levels. Ordered from highest to lowest:

- (iv) A possible casting area consisted of an area about 1 x 2 meters with a dense spread of large lumps of baked clay, crucible fragments, animal bone, charcoal and sherdage, some of which is burnt. The feature was not found on a clearly defined habitation horizon. The author estimated that the feature most likely dates from sometime during the Middle Period, perhaps MP VII.
- (v) A charcoal cluster about 30 cm in diameter labeled "hearth", 15-20 cm above the surface of the Lower Grey, is a good example of a possible ground level hearth. The layer shows clear occupation activity in the form of numerous postholes cut from this level, and one ceramic spread of MP VII sherds. There is no evidence of overlying features cut down to the charcoal concentration. The charcoal cluster likely was deposited during the early Middle Period.

- (vi) A feature referred to as "charcoal concentration & ash = hearth?" lay at the base of the Lower Middle Red just on top of the Lower Grey Stratum. Plans show a hole of 50 cm depth underneath the feature, and another hole of 25 cm depth overlying the feature. However, even if the charcoal derived from the overlying hole, it would still derive from the Lower Middle Red and thus was probably deposited during the early Middle Period.
- (vii) A deep, complex feature about 30 cm in diameter extending from the base of the Lower Middle Red, through the Lower Grey into Sterile (about 70 cm) contained clay, burnt clay, laterite, and charcoal. The lower part of this feature was termed "double hole with charcoal". If the feature truly represents a single event originating from the Lower Middle Red, the deposit may date from the early Middle Period.
- (viii) A pit about 60 by 30 cm in breadth and 30 cm deep had a substantial amount of charcoal towards one side. The pit seems to derive from about 10 cm above the surface of the Lower Grey. The feature likely derives from the early part of the Middle Period.
- (ix) A "floating" feature (i.e. not in clear association with a habitation horizon) 20-30 cm below the surface of the Lower Grey Stratum was termed "charcoal" on one plan and "hearth" on another plan. Although the charcoal concentration is situated within the Lower Grey Stratum, the overlying plans from the base of the Lower Middle Red show two holes, one directly over and cut to the depth of the cluster, and one intersecting the charcoal concentration. The author concluded that the charcoal could have been deposited during the late Early Period or alternatively during the early Middle Period if the feature derived from a subsurface hearth.
- (x) An irregular clustering of charcoal termed "hearth?" was found in the Sterile Stratum.

These ten potentially in situ charcoal-bearing features illustrate the considerable difficulty in both the identification of hearths at Ban Chiang, as well as their interpretation relative to the soil and burial stratigraphy. In only one case, the possible casting area (iv), was a defined, unambiguous activity within a limited area identified. In only two cases (ii, iii) were distinctive soil textures or colors noted, by implication changes from proximity to heat, and for one of these features (iii) no associated charcoal was recorded. Four cases (i, vi, vii, viii) consisted of charcoal concentrations in association with pits of uncertain function. Three features (v, ix, x) were recorded as merely clusterings of charcoal. On the basis of these descriptions it is clearly a matter of

conjecture whether any of these features except for the casting area represent in situ hearths.

As for stratigraphic interpretation, there is only one charcoal feature (v) clearly associated with a well defined habitation surface and soil horizon. The majority have more than one possible interpretation with respect to the soil and/or burial sequences. Several can be interpreted as probably coming from a particular Period, but not specified to burial phase. Three of the deposits (iii, vi, ix) had overlying holes cut down to the level of the charcoal. Given the problems determining the stratigraphic sources (i.e. relationship to prehistoric ground level at the time of deposition) of both the burials and these potentially in situ charcoal deposits, it is difficult to use them to date the burial sequence with any degree of specificity.

If for the sake of argument we accept these ten charcoal concentrations as in situ deposits and accept their prima facie stratigraphic positions, it is clear that restricting dating of the site to these few charcoal deposits would result in a very limited chronological framework. None of the above deposits relate to the Late Period. Five of the seven BCES examples seem to derive from the base and lower portion of the Lower Middle Red Stratum. Of the two other so-called "hearths" in BCES, both are stratigraphically problematical. One is in the Sterile Stratum. The other (ix) "floats" in the Lower Grey with no indisputable stratigraphic relationship to any single burial phase; on the basis of relative depth it could be as late as EP V or as old as EP III. Moreover, it could have been cut down from the base of the Red Stratum. In BC, all potential hearths seem to relate to sometime in the Early Period. Quite possibly they could all derive from EP II.

In sum if the chronology of Ban Chiang burial phases was based solely on these potentially in situ "hearth?" deposits, it is conceivable that only the early Middle Period, and EP II might be datable. Moreover, because one cannot be sure of the correct attribution of many of the charcoal deposits to the sequence, erroneous interpretations are possible. Trying to use dates from these deposits as termini post quem or termini ante quem, in the absence of precise soil stratigraphy, would result in an almost uselessly vague chronology.

Therefore, if one were to date the Ban Chiang sequence in hypothetical hindsight, what options would the archaeologist face? One could limit the dating of the site to charcoal specimens that fit Higham's definition of in situ and have a clear stratigraphic interpretation. This course would result in only one or two dates for the entire sequence (e.g. (iv), (v) - both from the early Middle Period) and leave the rest of the sequence undated. Or, one could explore other options in an attempt to put forward a best effort to achieve a maximum understanding of Ban Chiang's unduplicated



sequence. Might there be some way to employ charcoal specimens from less than ideal contexts in dating the Ban Chiang sequence?

In the next section we explore a broader view of the use of charcoal deposits for dating by examining what happens to charcoal in ethnographic contexts. An understanding of depositional processes of charcoal in Southeast Asian villages might clarify potential sources, and hence stratigraphic relationships, of various kinds of charcoal deposit, including the charcoal concentrations discussed above. With consideration of processes of charcoal deposition we may find a variety of types of charcoal deposit usable in dating sites like Ban Chiang.

#### ETHNOGRAPHIC OBSERVATIONS ON CHARCOAL DEPOSITION

The use of ethnographic analogy for charcoal deposition is based in part on the evidence for continuity in certain aspects of lifestyle in this region. In particular, the rarity of living floors but presence of postholes found throughout the prehistoric deposit suggest that pile-built dwellings were used in the past as they are in the present. Living in pile-built houses may have implications for charcoal deposition. The following discussion is based on (1) ethnographic sources, (2) personal observation during the author's stay in Ban Chiang from October 1979- May 1981, and (3) conversations in August 1985 with Sophin Kotanone, a 58 year old man who grew up in Nong Khai, Thailand, lived most of his adult life in Laos, and now lives in Philadelphia.

#### Fire-Making Activities in Modern Day Northeast Thailand

The prevalence of general provenience charcoal samples and the rarity of clearly recognizable hearths in the Ban Chiang prehistoric deposit suggests that most fire-producing activities were undertaken in a manner of low archaeological visibility. Correspondingly, most hearth-making activities in the Ban Chiang region today are unlikely to leave significant traces in the archaeological deposit at the location of the fire.

For example, cooking (surely the most common fire-making activity in a village) usually takes place not on the ground surface but within raised dwellings. Most contemporary villagers in the Ban Chiang region use small portable poured-cement stoves which contain charcoal and upon which pots or woks can be set. The more traditional household hearth - a shallow, wooden, earth-filled box placed on the raised platforms in the dwellings - can still be found in the region. Three baked clay balls serve to support cooking vessels. Household hearths within pile-built dwellings are used by other groups in Southeast Asia (e.g. Condominas 1977:12). Charcoal from these "house-hearths" would reach ground level when the hearths are cleaned out and the debris tossed onto the ground, or when the building collapses. This charcoal is likely to be dispersed by traffic of humans and animals (which are often kept under the pile-

built houses), or by heavy rains. According to my observation and Sophin's opinion, very little ground surface under and around houses would be protected from this intensive ground level traffic. Only unusual sheltered circumstances would result in the preservation of a cluster of charcoal.

There are various occasions when villagers build fires at ground level. One can sometimes observe cooking fires on the ground under or near houses for occasional cooking chores which would be inconvenient using the small portable stoves. Examples include roasting yams or bamboo containers of sticky rice. Another purpose for a ground level fire in a village would be for warmth during the evenings or early mornings of the cold season. A third type of ground level fire are those built under houses during the rainy season to smoke out mosquitos from the animal pens as well as from the living quarters above. A single location under the house may be used throughout one season but a different location is likely to be chosen the next year.

In general, these ground level fires tend to be ephemeral with locations selected for an occasion but not necessarily reused for a subsequent occasion. They have no permanent demarkation such as stones (probably in part due to the paucity of stones in the area). Their remains would most likely be trampled and dispersed leaving no archaeological indication other than contributing to the generalized distribution of charcoal. In special circumstances charcoal clusters from such hearths might survive if, for example, a house collapsed on a hearth before it dispersed, or if an unusual placement of the hearth protected it from traffic patterns, but these would be exceptional.

If most fire-producing activities are unlikely to leave in situ charcoal depositions, what circumstances might lead to those substantial deposits that do sometimes exist in these sites? In the opinion of Sophin, there are two types of hearth which are likely to leave substantial accumulations of charcoal. Charcoal-making kilns today tend to be very large- 1-2 meters in vertical height. Since they are probably quite recent and are usually outside of the village they will not be further discussed.

The other type of hearth that may leave a deposit of clustered charcoal is called a tao hang. Tao hang can be translated as "trough hearth", but since some varieties do not look like our concept of a trough, the term "subsurface hearth" will be used instead. This term covers a variety of shapes and sizes of hearths some of which could produce a deposit of charcoal well below ground level. In particular, one type consists of an underground chamber with a lateral access hole for fuel and a central vertical hole or flue between the chamber and ground level on top of which rests the cooking pot. The depth of the chamber may be 25-50 cm. The fuel hole can be cut at an angle and a large log fed in continuously as needed. Other varieties may look more like a "trough"- semi-lunate in cross section with fuel

access from two sides, and these would be less likely to preserve a clustered charcoal deposit. Sophin says tao hang are often used for cooking pig slop or other large cooking chores such as food for festivals. The hearths can be used until they collapse, perhaps as long as several months or a year.

Mention should be made of other potential sources of charcoal in village deposits. Industrial activities using fire found in some northeast Thai villages include pottery firing, salt-making, lime-making, and iron smithing. Some of these can employ simple tao hang. Pottery firing usually takes place outside of village confines. Pots are fired on the edges of the village in the open air on bamboo platforms with straw fuel. The remains of any single firing may easily be dispersed, although perhaps repeated firings over the same general location would result in a broad buildup of small charcoal fragments and ash. Khok Phanom Di may have such remains of pottery firing (Higham et al. 1987).

Fires used in the salt-making process are small and often trough-like, but the author has only observed them outside of villages close to salt-yielding soils. Fires for reducing snail shell into lime for betel chewing might be lit once a year by a household and might be archaeologically recognizable from the association of shell with the charcoal. Iron smithing takes place generally within the village. Smithies are often associated with more substantial associated structures such as roofs which are used over several years. A shallow variation of the trough hearth used to heat the iron tools over charcoal is made of packed earth or clay. The author has seen charcoal cleaned out from this type of hearth when not in use, but one could imagine that the shallow trough (10-20 cm) might offer some protection from dispersal.

Other events might contribute to charcoal in village deposits. During the initial settlement of a location the land may be cleared of vegetation using fire. Also buildings may burn down which would also contribute to horizontal spread of charcoal and could be the source in some cases of charcoal in postholes. Awareness of these types of fire and charcoal-producing activities may help archaeologists in this region to interpret charcoal deposits better in prehistoric sites.

#### Charcoal and Funerary Rites

Charcoal excavated in association with burials is the second most common category in BCES and the most common in BC. One might at first assume that charcoal associated with burials is redeposited from the soil matrix, but there is distributional and ethnographic evidence to suggest otherwise. It has already been observed that 28 out of 34 BC charcoal specimens were considered burial-associated by the excavators. This remarkable degree of association of charcoal with burials at BC suggests three possibilities: 1) that charcoal unassociated with skeletons was systematically ignored by the

excavators; 2) that grave diggers had an uncanny ability to locate graves so that they would intrude into most of the preceding hearth deposits at the locale; or 3) charcoal was deposited in the grave as part of the funerary ritual. The first scenario is possible but not probable. The second is untenable. The third possibility has yet to be seriously entertained by regional archaeologists and, indeed, ethnographic examples exist supporting potential contemporaneity of charcoal in association with burials.

Of course the modern day funeral rites practiced among the Thai-Lao in northeast Thailand cannot be used as direct ethnographic analogies since the rites are Buddhist-derived and the body is cremated except for persons who die unnaturally (Tambiah 1970). However, perusal of ethnographic literature on mainland and insular Southeast Asian ethnic groups which do not adhere to any of the world religions and hence may have more indigenously based funerary practices reveals references to the use of charcoal in death rituals.

Metcalf (1982:84,88) notes two aspects of funeral rites of the Berawan of Borneo which might result in the deposition of charcoal with the body. First of all he notes that (1982:84): "The bottoms of coffins are often filled with concoctions of earth and ashes designed to soak up the products of decomposition and prevent their escape". Secondly he records (1982:88) that the funeral procession out of the house included an individual bearing "a large iron pot containing smoldering brands, the stated purpose of which is to keep the corpse warm in transit to the graveyard." Unfortunately he never states what happened to those coals once the procession reached the graveyard, but it is not inconceivable they were placed in the grave.

Dentan's (1968:90) description of burial rites for the Austro-Asiatic speaking Semai suggests a source of grave-associated charcoal: "Ideally there should be three fires at the head of the grave and three at the foot... The underlying rationale of these fires is that fire keeps evil emanations from the grave at bay."

Lewis and Lewis (1984:128) refer to a Hmong funeral procession in which a girl "carries a burning brand for the deceased to 'see the way'". In this case the brand was discarded on the way to the cemetery.

Perhaps most significant are funerary details observed among the Mngong Gar in Vietnam, an Austro-asiatic speaking group, considered by Condominas (1977:3) as part of "the oldest stratum of the Indo-Chinese peoples". Condominas' (1977:283) description of an occasion when a coffin is about to be brought to the cemetery has important implications for the current topic. The lid of the coffin was lifted so that the sister of the deceased could place "some charcoal beside the corpse; the coals will act as guides for the dead man on his journey toward Yaang Boec, the Spirit who rules the Underworld." Furthermore, seven days after interment (Condominas 1977:303), villagers returned to the cemetery to place on the grave

items including foods, seeds, miniature representations of blankets, coops, and bowls. "Accompanying these are the pieces of charcoal that... will serve the others as scouts and guides."

A more exhaustive search of the ethnographic literature might reveal more examples, but these four examples are at least suggestive (even though not proof) that fire and charcoal may have a widespread indigenous symbolic role in funerary rites in Southeast Asian societies. Of course it cannot be ruled out that the use of charcoal in funerary contexts is not somehow ultimately derived from contact with Hindu and Buddhist cremation rites. Nevertheless, at the very least, the specific example of the Mnong Gar suggests how and why charcoal might be purposely placed in a grave and shows that the practice has existed in the mainland Southeast Asian region. While of course one cannot argue a direct ethnographic continuity between the Mnong Gar and ancient Ban Chiang, this example is particularly intriguing and of obvious significance to archaeological reconstructions. In short the ethnographic examples indicate that grave-associated charcoal need not be arbitrarily dismissed as redeposited.

#### ARCHAEOLOGICAL IMPLICATIONS OF ETHNOGRAPHIC CHARCOAL DEPOSITION

Using the above ethnographic observations as a hypothetical model for the deposition of charcoal at Ban Chiang and similar sites, implications of these observations for stratigraphic interpretation of three major categories of charcoal specimens will now be reviewed.

##### (1) Charcoal of General Provenience

The ethnographic present suggests numerous sources for the dispersed charcoal found in village deposits. Charcoal from most fire-making activities is likely to be scattered and would thereby contribute to the generalized charcoal deposit at a site. In order to assess if non-localized charcoal might be useable for dating, let us examine hypothetically its likely stratigraphic deposition.

The charcoal from the various types of ephemeral ground level hearths and from cleanings from subsurface and house hearths would commonly be deposited on the village living surface. The dispersal of this charcoal by intense ground level traffic and rain would most likely occur over the same surface on which it was initially deposited. Other contemporary household dumpings including broken pottery would be deposited on the same surface. If this process accounts for most of the charcoal of generalized provenience, layer samples of charcoal may be in correct stratigraphic context and in association with contemporary habitation materials such as refuse, broken pottery, etc., which are subject to the same processes of dispersal. Therefore charcoal from a layer sample has the hypothetical potential to date from the general layer from which it derived.

Unfortunately, in a site with considerable intrusive activity, it would be impossible to determine that a particular general layer charcoal sample does not include stratigraphically displaced charcoal. However, the displacement of large amounts of charcoal by, for example, postholes dug down into hearths would be uncommon in situations such as Ban Chiang where hearths are rare. Moreover, the quantity of charcoal displaced from digging for postholes would likely be small relative to the quantities deposited on the living surface from hearth cleanings contemporary with the pile dwellings. In sum there would probably be no greater upward displacement of charcoal than of other habitation debris such as broken potsherds.

The best candidates for dating among dispersed charcoal samples would be those recovered from levels where there is other good evidence of an extensive habitation horizon. A substantial amount of charcoal collected within a restricted area such as a square meter or two from a habitation surface seems more likely to represent a direct deposit than a redeposit from a lower level, especially if there is no evidence that a charcoal concentration in the underlying layers was disturbed by intrusions originating from near the potential charcoal specimen. Displaced charcoal might be highly fragmented and dispersed in the process of removal from lower levels. Therefore, observations on the fragment size, density of distribution, total mass, and area of dispersal of charcoal fragments within a layer, plus specific comments on presence or absence of evidence for post-depositional disturbance including bioturbation would be very helpful in evaluating layer specimens for purposes of dating. At Ban Chiang, charcoal from the top of the Lower Grey Stratum at BCES, a surface described as "ashy, full of charcoal and cut by many postholes", would be a good potential layer specimen.

## (2) Charcoal Concentrations

The discussion of ethnographic hearths indicates why the stratigraphic interpretation of charcoal clusters in archaeological deposits like Ban Chiang is problematic. Ethnographically, ground level hearths tend to be uncommon and ephemeral, and are unlikely to result in substantial clustered deposits of charcoal in villages where there is intensive ground level traffic under and between pile-built houses. The problem then becomes how to interpret those charcoal clusters that are excavated which, do to their size, are often desirable specimens for dating. In order to know what part of the cultural deposit a charcoal cluster dates, we need to consider what the stratigraphic source of the charcoal might have been, and what conditions lead to its preservation.

Tao hang or subsurface hearths are likely to preserve substantial clustered charcoal deposits. It is noteworthy that if subsurface hearths were used in prehistoric times, any charcoal caught in the collapse of the subterranean variety could be left in place at depths of up to 50 cm below ground level.

Given the possible prehistoric use of subsurface hearths and the tendency for ground level hearths to disperse under conditions comparable to today's, archaeologists cannot assume automatically that a charcoal cluster was a ground level hearth which can be used to date the level from which it derived. Yet the archaeological detection of a collapsed subsurface hearth may be difficult, especially if the archaeologist is not anticipating such a hearth. The remains might appear as charcoal in a depression and at first be interpreted as a ground level hearth. In order to investigate the possibility that a charcoal concentration came from a subsurface hearth, the archaeologist might look for overlying or adjacent holes cut to the level of the charcoal such as were observed for charcoal concentrations (iii), (vi), and (ix). Conceivably, however, the collapse may destroy any traces of the access holes. Collapsed lateral access holes in particular are unlikely to be detected in an excavation based on horizontal removal of soil.

Any substantial accumulation of charcoal in association with heat modified soil may be a possible candidate for a subsurface hearth. Because the fire chambers of these hearths are protected and can be used for a sustained time period, the surrounding soil may be more likely to show textural and color changes due to heat exposure than soils underlying ground level fires. Hearths employing clay reinforcement might be detected as charcoal mixed with baked clay.

One cannot of course disprove the possibility that ground level hearths could have been preserved as a charcoal cluster in some circumstances. Careful consideration of the surrounding deposit may help identify ground level hearths. As with dispersed charcoal, evidence of other habitation activity at the same level as the charcoal concentration that would indicate a habitation surface, such as numerous postholes, scatters of abraded ceramics and burnt animal bone, might be used to support an argument for a ground level hearth. Also lack of evidence for a superimposed intrusion in a site with good soil stratigraphy might support an interpretation of a ground level hearth. Applying this rationale to the charcoal concentrations at Ban Chiang discussed previously, (v) is the most likely possibility for a ground level hearth. A subsurface hearth might not be associated with a level intensively used for habitation, appearing instead to "float" in the deposit, e.g. Ban Chiang charcoal concentrations (i), (ix), and (x). It must be borne in mind, however, that the charcoal cluster seemingly in association with a living surface could coincidentally have been dug down to the level of a previous habitation from subsequent use of a site. On the other hand absence of other evidence of habitation activity does not prove that a charcoal cluster derived from a higher level.

### (3) Burial-associated Charcoal

The importance of the ethnographic evidence supporting the possible contemporaneity of charcoal found with a burial is self-evident. The problem for the archaeologist is to try to

differentiate charcoal specimens redeposited from the soil into which a grave was dug from charcoal placed synchronously into the grave. Charcoal within grave pottery might be a preferred specimen. The Mngong Gar example shows that charcoal might be deposited close to the body as well as in the grave fill. Considering the implements that were likely used to dig the grave (Condominas 1977:103 observed the use of "a long stick with a chamfered point...fashioned on the spot"), redeposited charcoal seems likely to be found in a more fragmented and dispersed state than charcoal deliberately placed in the grave. Hence observations on location of the specimen in relation to the skeleton, size of fragments, degree of dispersal, and mass of deposit may help improve the chances of selecting synchronous burial-associated charcoal for dating.

#### Summary

To summarize the archaeological implications of ethnographic observations on the deposition of charcoal:

(a) The identification and stratigraphic interpretation of possible hearths may often be equivocal. This fact, plus the rarity of their preservation in many sites in the region including Ban Chiang, makes charcoal dates from putative hearth deposits, while in many respects desirable, insufficient as the sole basis for absolute chronology in the area.

(b) Other sources of charcoal such as layer samples and burial-associated samples may represent stratigraphically in situ deposits and therefore have the potential to contribute to absolute chronologies, although the possibility of redeposition of any individual sample may not be disprovable.

#### A PROPOSED DATING STRATEGY FOR BAN CHIANG AND RELATED SITES

These observations have implications not only for assessing the stratigraphic significance of individual charcoal specimens, but for the overall strategy for developing an absolute chronology for sites like Ban Chiang. It is clear that the stratigraphic source of nearly any individual charcoal sample including those interpreted as hearths may be ambiguous. With this problem the ultimate answer to dating burial sequences in the region, as stated above, may be to resolve technical problems of bone and/or TL dates in order to be able to date directly stratigraphically unambiguous materials from burials. Higham's suggestion (see comment following this article) to date rice remains from burial pottery is also promising, although it would not be applicable to portions of sequences lacking rice remains.

Until such time that the research effort and money have been expended to make alternative dating techniques reliable, affordable, and otherwise practical options for archaeologists in this region, how can viable dating frameworks be developed on the basis of charcoal deposits which seem to be the most likely source of dates



for the near future? The only approach that can be considered, given the points made above, is a broad-based strategy which includes (a) a variety of types of charcoal deposit, and (b) more than one specimen per prehistoric temporal unit. The dating framework would be based on patterned, sequentially logical, and internally consistent associations of date ranges and cultural manifestations.

In order to implement this approach, a detailed relative chronology of burial phases, habitation levels, and soil strata must be developed preferably prior to the selection of charcoal specimens for dating. Charcoal samples ideally should include:

- 1) Two or more specimens attributable to any individual habitation level including charcoal from hearths, layer collections and postholes, especially if several postholes from the same level contain charcoal which might indicate ancient conflagration of a building. For habitation derived charcoal samples to be useful in dating burial sequences, they should preferably be associated with habitation levels in demonstrable stratigraphic relationship to the burial phase sequence. Charcoal samples associated with a habitation level that is not in stratigraphic relationship to a burial sequence obviously cannot be used as terminus post or ante quem for a burial phase. Dates with a clear attribution to a habitation horizon have priority and can serve as anchors to the overall dating framework which may need to be "filled out" with dates from stratigraphically less ideal contexts.
- 2) Two or more samples from each burial phase. These specimens would be particularly useful if the dating of habitation levels was clearly an insufficient basis to date burial phases, and if other evidence, such as frequency of association, size of the specimen, placement relative to the burial, suggested that the association of charcoal with burials might be contemporary. Preferable specimens would be sizable lumps found in pots, secondly those close to the skeletons, although the ethnographic examples showed that charcoal in the grave fill may potentially be contemporaneous with the grave as well.
- 3) Charcoal deposits not directly associated with a burial or an occupation horizon require careful consideration. The problem with dating events such as burials in one square by a "floating" charcoal date from another square at a seemingly comparable stratigraphic position is the assumption of an even horizontal soil buildup. If northeast Thai villages can serve as an analogy, a more realistic assumption is for uneven soil buildup. Areas between structures are subject to greater erosion from traffic and especially rains (which can form large gulleys) than areas under habitations. In sites with very slow and uneven buildup of the deposit such as Ban Chiang, (particularly the basal meter of deposit at BCES which may represent over 2000 years), events from very different time

periods may be deposited at comparable relative depths. The problem of interpreting the relationship between the cultural deposit and soil stratigraphy is compounded when considering that, for tropical areas in particular, soil distinctions can be both obliterated and created by extra-cultural factors such as water and temperature regimes.

In sites with little soil stratigraphy but great time depth, layer, cluster, or posthole charcoal samples not attributable to a habitation horizon can be related reliably to the specific features or burials which they superimpose or are superimposed by. In some cases the sequence of superpositions can be chronologically close enough that a "floating" date (i.e. not associated with a well-defined habitation surface) can help to define phase chronology. However, if the preceding and succeeding burials are from chronologically distant phases (or lack cultural attributes that allow the burial to be assigned to a phase), the intervening date can have little precise meaning by itself.

#### CONCLUSIONS

The logic and analytical approach advocated in the preceding section was employed as far as possible in the revision of the Ban Chiang chronology as given in Table 1 (White 1986). Ban Chiang is not an ideal test case for the proposed strategy since it was applied in a situation where the radiocarbon samples had been excavated and selected some years ago and interpreted by someone other than the excavator. The records on individual specimens did not meet the criteria proposed here. However, the 33 charcoal dates available from Ban Chiang did include a spectrum of contexts including 22 from burials, and the rest from putative hearths, layer samples, pits and other features. From these, an internally consistent framework was developed. Only seven of the dates were substantially inconsistent with the proposed chronology. The revised sequence was compared in detail to the sequence of the nearby site of Ban Na Di (Higham and Kijngam 1984) and found remarkably congruent. Of course the author fully acknowledges the limitations in the proposed chronology and anticipates revisions in light of future data.

The purpose of this article is not to prove a chronology or a strategy for developing a chronology, but rather to contribute to the ongoing discussion on the problems of developing prehistoric sequences for Southeast Asian sites. Higham's call for the elevation of archaeological standards, while unquestionably welcome, should not result in inadvertent exclusion of potentially significant evidence. At this early stage in the development of regional chronologies for Southeast Asia all chronological evidence needs to be addressed, and none should be arbitrarily excluded. The interpretation of the data that are available serve as a necessary step to any subsequent re-examination. Hence interim chronologies are essential stepping stones to our discussion of the region's prehistory.

While this paper advocates a broader approach to charcoal specimens than advocated by Higham, this is not to say that all dates are of equal quality and should be given weight. Dating frameworks and individual dates will need continual re-examination in light of varying interpretations or new evidence as it becomes available. The author advocates refining our procedures and analytical logic to cope with the data that our sites produce, while remaining flexible in our interpretation in anticipation of forthcoming evidence. Excessive rigidity is not in the region's best interests at this time. In some cases, less than ideal dates may be all that is available. At this stage archaeologists need to maximize their data since with so few sites excavated, each site can hold unique data which may not be duplicated for a number of years.

Such is the case with Ban Chiang which holds key importance not only for Thailand's prehistory, but for the entirety of mainland Southeast Asia. While Ban Chiang hardly resolves all the chronological issues in the region, to have one 4000 year sequence from one site is a significant contribution toward regional chronology. Due to this special aspect of Ban Chiang, development of even an interim chronology warrants a best effort despite the difficulties involved. One hundred years from now our struggles over charcoal provenience will have faded, and Ban Chiang will not seem as central a site as it currently appears. At present, however, its sequence is important not only for archaeologists working in northeast Thailand, but for many other scholars seeking to synthesize the region's past, to make comparisons with other areas, to develop an understanding of early agriculture and ancient metallurgy. While not the only relevant site, Ban Chiang is certainly one of the most discussed. It is unfortunate that much of this discussion has been based on misunderstanding and misinformation. In the hopes of clearing up the misunderstanding of a site that should be appreciated for the depth and richness of its cultural sequence even more than for its metallurgical notoriety, an effort has been made to carefully examine the Ban Chiang radiocarbon evidence.

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Table 1: The revised chronology for Ban Chiang compared with the preliminary chronology of Gorman and Charoenwongsa 1976.

New Phase	Proposed Date Range	Original Phase	Key Ceramics	Original Date Range
LP X	200 B.C.- A.D. 300	VI	Red slipped and burnished	300- 250 B.C.
LP IX	300-1 B.C.	V	Red-on-buff painted	1000-500 B.C. Tentative
MP VIII	400-200 B.C.	(undefined)		
MP VII*	800-400 B.C.			
MP VI	1100- 700 B.C.	IV	Incised and painted	1600- 1200 B.C.
EP V	1600- 900 B.C.			
EP IV	1900- 1400 B.C.	(undefined)		
EP III*	2100- 1700 B.C.	II**	Beaker forms	3600- 2900 B.C.
EP II	3000- 1900 B.C.	III	Curvilinear incised	2000 B.C.
EP I	3600- 2500 B.C.	I**	Black to grey burnished and incised	3600- 2900 B.C.

\* MP VII burials have the earliest iron grave goods. EP III has the earliest bronze artifact in a grave.

\*\* Original Phases I & II were not differentiated ceramically or temporally in Gorman and Charoenwongsa (1976). In Gorman and Charoenwongsa (1978), however, the beakers were indicated as the second phase even though Original Phases I and II were given the same date range.