

The Ancient Inhabitants of Ban Chiang

The Evidence from the Human Skeletal and Dental Remains

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INTRODUCTION

Studies of human skeletal and dental remains excavated at Ban Chiang provide physical anthropologists with some important insights into the biological, demographic, and epidemiological histories of these early inhabitants of northeast Thailand. Their physical appearance, ages to which they survived, the diseases they suffered, the changes which mark their nearly four thousand year history, and the affinities they share with other prehistoric and near contemporary populations are a few of the major topics addressed in this paper.

With the author's assistance, approximately 46 inhumation burials were uncovered during the first season of excavation at Ban Chiang in 1974. Preliminary sorting, cleaning, and reconstruction of these burials then commenced at the site. Later, these remains and an additional 77 burials from the following season of field work in 1975 were sent to the University of Hawaii where a more detailed study was initiated. The statistical sample from Ban Chiang represents 112 individuals and includes males and females ranging in age from newborn infants to adults of 50 years or older. In all, nearly six years were required to complete the analysis of human remains from Ban Chiang, a project which involved the assistance of many of the author's students.

The size, representativeness, state of preservation, and provenance of the Ban Chiang material make it one of the most important samples of human skeletal remains now available for describing the early inhabitants of the Khorat Plateau region of northeast Thailand. More detailed descriptions of this work are presented elsewhere (Pietrusewsky 1978, 1981).

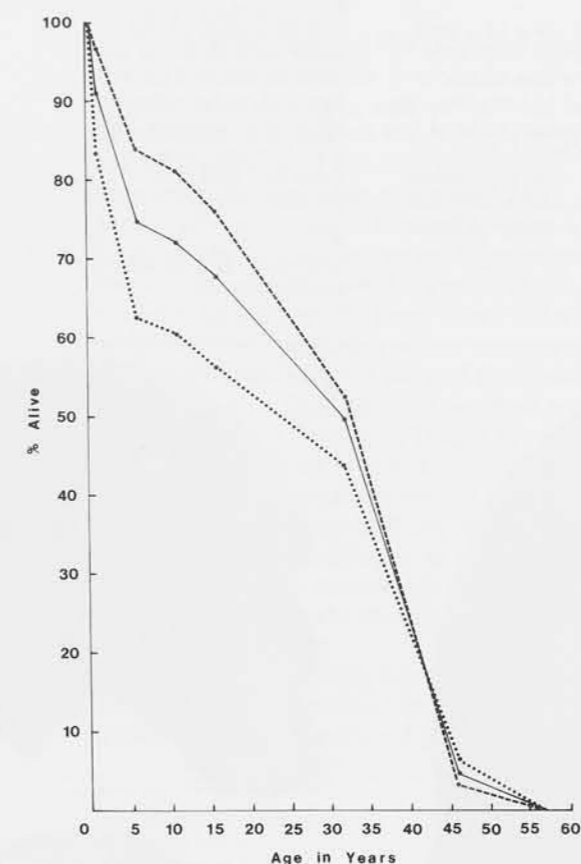
According to preliminary interpretations by Gorman and Charoenwongsa (1976) the inhumation burials from Ban Chiang derive from one (or more) of the site's prehistoric

funerary phases. In a few instances, burials have been partitioned into earlier and later groups to investigate the possible existence of temporal trends at the site. In most cases, however, interpretations are based on the entire sample of burials representing all prehistoric cultural phases. These latter date from approximately 3600 B.C. to A.D. 200, or a time period of roughly 4000 years, referred to by some as the early metal age of Thailand.

LIFE AND DEATH— DEMOGRAPHIC STATISTICS

The essential demographic features of the Ban Chiang sample are largely assessed through the construction of composite life tables; procedures related to those utilized in the study of contemporaneous human populations. To examine the possibility of temporal changes occurring at the site, a comparison of the site's earlier and later burials was made. Caution in accepting these results is advised, however, due to the possible unevenness of the sample's age and sex distribution. First, the number of adult males (54) exceeds the number of adult females (39) in both earlier and later periods of cemetery construction. Second, earlier burials contain a disproportionate number (18) of infants and young children when compared with the later burials (10). This latter observation parallels the presence in the earlier phases of jar burials, which characteristically contain the remains of infants and young children.

The average age-at-death for the entire Ban Chiang sample is estimated to be 31 years. Among subadults, the highest mortality is experienced during early childhood. Mortality among the adult cohorts peaks at middle age with few individuals surviving beyond 46 years of age. Dividing the sample into an earlier and later component produces slightly lower average age-at-death rates (27 years vs. 34 years) for the earlier group of burials, reflecting the generally higher infant and child mortality

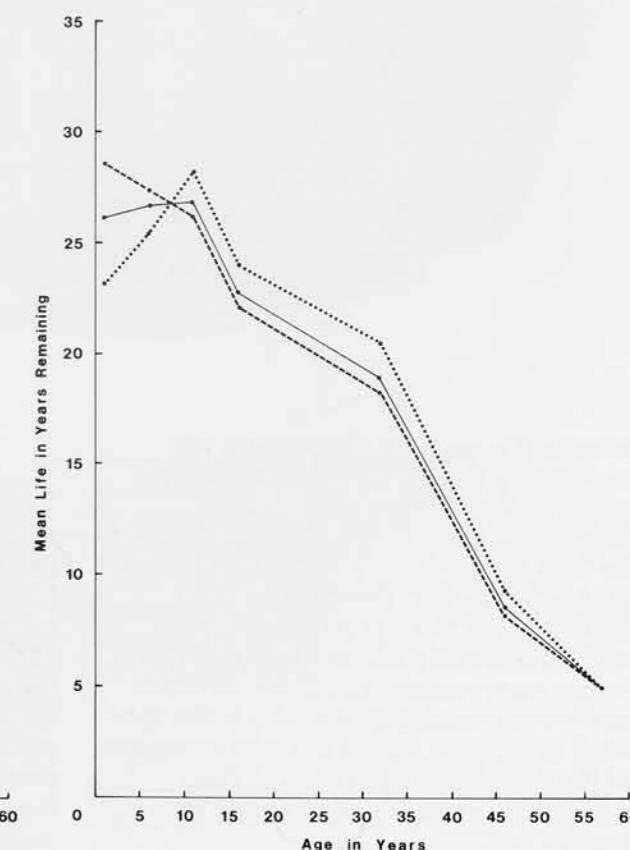
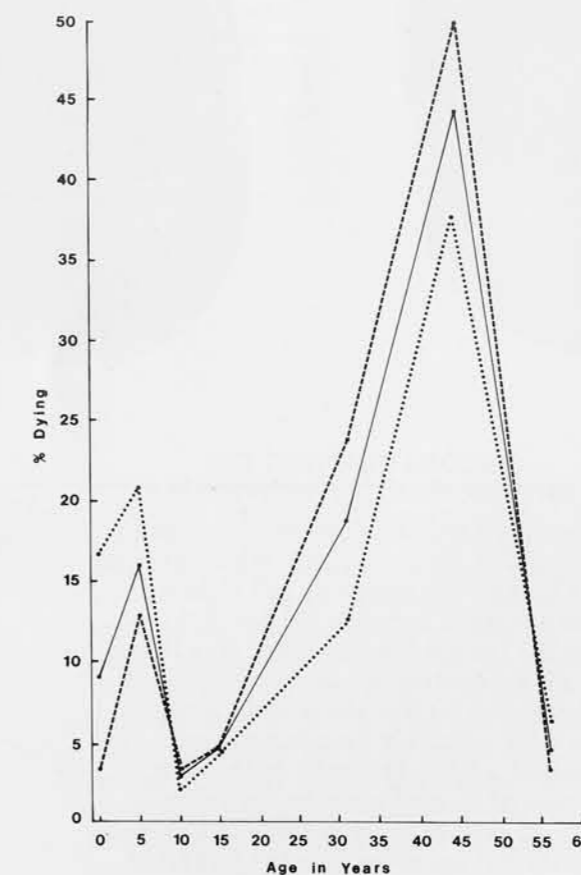


1 Survivorship curves for earlier, later, and combined earlier and later burials from Ban Chiang. In this diagram the percentage of individuals alive is plotted for each age category. Lower survivorship rates are registered among the earlier group of burials, especially in the younger age categories.

2 Mortality curves for earlier, later, and combined earlier and later burials from Ban Chiang. The percentage of individuals dying is recorded for each age category. Pre-adolescent mortality is found to be higher among the site's earlier inhabitants.

3 Life expectancy curves for earlier, later, and combined earlier and later burials from Ban Chiang. Mean number of years of life remaining to individuals in each age category is presented. Lower life expectancy rates characterize the pre-adolescent individuals among the earlier group of burials. Higher life expectancy in the adult age categories is demonstrated for these same burials.

..... Earlier Burials
- - - - - Later Burials
————— Combined



4 Facial view of a well preserved skull of a middle-aged male (Burial No. 47) from the 1974 excavations at Ban Chiang. Note the wide face, prominent cheek bones, and fairly well developed brow ridges.

5 Left side view of the same skull showing the even contour of the vault, moderate brow ridge development, and well formed cheek bone and mastoid process.

6 Superior view of the same skull.



rates in this segment. Conversely, life expectancy and survivorship are slightly higher in the later groups of burials. Viewed cautiously, then, these preliminary findings suggest a shift in the demographic profiles between the earlier and later inhabitants of the site, a temporal shift signifying slightly longer life expectancy, higher survivorship, higher age-at-death, and lower mortality (especially in the sub-adult categories) among the later occupants of the site. Some indications of these demographic trends are presented in Figures 1-3.

RECONSTRUCTING THE PHYSIOGNOMY OF INDIVIDUALS

Compared with modern-day inhabitants of the region, the prehistoric inhabitants of Ban Chiang were relatively tall statures. Males averaged between 165 and 175 cm, while the female average range was 150 to 157 cm. Reconstructing body proportions further indicates that these early inhabitants were relatively long-legged and possessed a fairly muscular build. The presence of faceted areas in the ankle region, as well as other skeletal indicators, suggests that squatting was the preferred

resting posture.

Physical features of the face and skull include relatively wide foreheads with small bilateral bulges, non-projecting faces of medium to broad width, high narrow eye sockets, expansive palates, prominent cheek bones, and high-vaulted skulls. Moreover, male skulls tended to have a long narrow construction with prominent brow ridge development. Female skulls are broader and generally have vertical but well rounded foreheads when compared with male specimens. Many of the lower jaws from Ban Chiang are described as 'rocker jaws,' a condition found predominantly among Oceanic (especially Polynesian) populations where the mandible, because of a marked convexity on its underside, has a tendency to rock back and forth when set in motion on a flat surface. Figures 4-6 illustrate some of the features mentioned thus far.

Examining the teeth from Ban Chiang allows some generalization as to the health, possible diet, and cultural practices of

7 Left view of lower jaw of Burial No. 2 (middle-aged male) from the 1975 excavations at Ban Chiang, displaying extreme states of dental wear, destruction of tooth crowns, tooth decay, and evidence for gum disease.



these prehistoric inhabitants.

One of the most striking features of the Ban Chiang dentitions is the unusual combination of relatively large upper molar teeth in jaws which otherwise contain small teeth, a combination of features which appears to be unique to Ban Chiang. Furthermore, there is some evidence to indicate that tooth reduction has occurred at the site, when the tooth dimensions of earlier and later burials are compared.

Other noteworthy features of the Ban Chiang teeth include a relatively frequent occurrence of shovel-shaped incisors, a

condition where the inner surfaces of the upper incisors have raised edges. Edge-to-edge tooth bite and tooth staining were also observed. All features are fairly common in Asiatic dentitions. The observed tooth staining may indicate that these people were chewing betel nut, a custom still practiced by the modern-day inhabitants of Southeast Asia and Oceania. Dental pathology includes excessive tooth wear (often to the extent of exposing the dentine and pulp cavities of the tooth), dental caries, abscessing, or erosion of the bone surrounding the supporting structures of teeth due to pus formation, and evidence of gum (periodontal) disease. The extreme levels of attrition observed on the biting surfaces of teeth would seem to indicate that the diet of these early inhabitants was relatively abrasive. However, other non-dietary causes of tooth wear need to be investigated. The equally high incidence of dental caries (which was probably underestimated due to the extreme dental attrition observed in these remains) suggests a high carbohy-

drate component in the Ban Chiang diet. Based on the present evidence, differences in dental pathology between the earlier and later burials of the site cannot be substantiated. Again, some aspects of dental pathology and morphology present in these remains are captured in the accompanying photographs (Figs. 7, 8).

DISEASE

The prehistoric inhabitants of Ban Chiang suffered from a variety of diseases including bone arthritis (or degenerative joint disease), tumors or tumor-like defects,

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Inferior view of upper jaw bone of Burial No. 65 (young adult male) from the 1975 excavations at Ban Chiang. Note the carious destruction of the third molar tooth crowns and exposure of dentine. The incisors are shovel-shaped. A slight palatine torus, or mound of bone, is also visible in the palate region.



diseases attributable to infection, a few trauma-induced bone maladies, and there is fairly extensive evidence for blood-related disorders such as anemia.

The most frequently observed pathological condition among these remains is thickening (porotic hyperostosis) of the cranial vault bones, a condition which is often attributable to one of several known anemias. Osteoporosis, or a fine pitting observable on the external surfaces of the cranial vault (a condition known to be associated with various anemias and/or vitamin deficiency), is another frequently observed pathology. Of the known anemias, Thalassemia, a genetically determined hemolytic anemia having several clinical manifestations, is documented as having widespread occurrence among the present-day inhabitants of northeast Thailand. Likewise, elevated frequencies of Hemoglobin E, an abnormal hemoglobin variant, have been demonstrated for the same general region. Furthermore, since both conditions largely coincide with the geographic distribution of malaria, a convincing case can be made that carriers (heterozygous individuals) for the condition enjoyed some resistance to malarial parasites. Thus, the pervasive cranial bone thickening found in the remains from Ban Chiang may possibly provide indirect evidence for the antiquity of malaria, Thalassemia, and various hematologic disorders such as Hemoglobin E which are found among the present-day inhabitants of northeast Thailand.

Osteoarthritis, or degenerative joint disease of the skeleton, is only minimally expressed in the remains from Ban Chiang. One possible exception is the hip socket of a middle-aged male which may be tentatively diagnosed as a severe case of osteoarthritis. (See Fig. 9.) Pathology of the

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The right innominate (hip) bone and portion of the upper leg bone (femur) from Burial No. 40 (middle-aged male) excavated in 1975 at Ban Chiang. Note the extreme arthritic lipping of the hip socket and the upper portion of the femur which has been tentatively diagnosed as severe osteoarthritis.



vertebral column is equally unmarked in the remains from Ban Chiang indicating, at least for the time being, that diseases such as vertebral tuberculosis are absent. A possible case of vertebral tuberculosis has been reported from Non Nok Tha, a nearby prehistoric site.

Very few examples of trauma were found in the Ban Chiang material. Three cases of healed fractures involving the clavicle were recorded. The only other notable trauma are several examples of possible skull trephination. The examples, four in all, are restricted to the skulls of adult males. One additional example of pathology is the skull of a young child (less than 3 years of age) which has a tumor-like defect (Fig. 10). This defect may have been produced by tumors originating

in the meningeal lining of the skull.

One final category of pathology which is common in Ban Chiang remains is the frequent presence of bony spurs (Fig. 11). These bony projections, which are common in the lower leg bones, may represent benign bone tumors or, more likely, the effects of extreme dorsiflexion associated with kneeling and squatting.

COMPARISONS WITH OTHER PREHISTORIC REMAINS

An earlier study (Pietruszewsky 1974) of human remains from a second early metal-age site, Non Nok Tha, in northeast Thailand, provides a limited base for comparing the Ban Chiang material. Demographic comparisons of the two samples indicate that infant and early child mortality is

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Internal view of a child's (1-3 years) skull (Burial No. 14) from the 1975 excavations at Ban Chiang revealing a tumor-like defect on the left side.



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Upper portion of a lower leg bone (tibia) from Burial No. 15 (adult female) excavated in 1975 at Ban Chiang. Note the large bony spur which may represent the effects associated with squatting and kneeling postures.



equally high for the two sites. Likewise, Ban Chiang and Non Nok Tha have similar adult mortality patterns. Only life expectancy and mean age-at-death are slightly higher in the Ban Chiang sample.

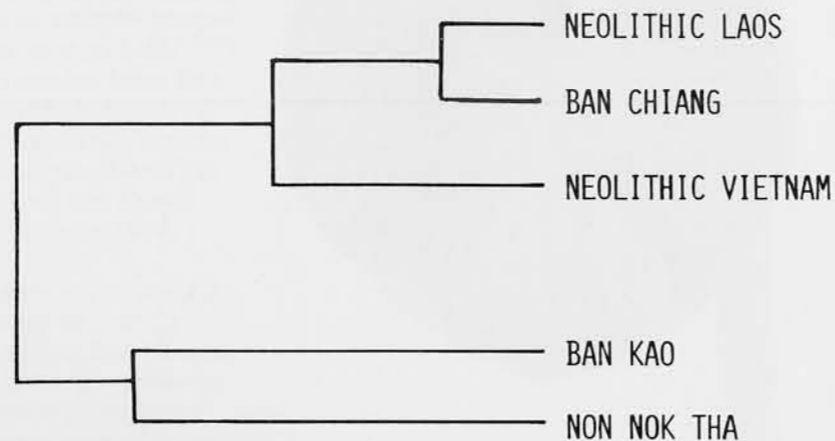
Other comparisons with Non Nok Tha indicate that the inhabitants of both sites were of approximately the same stature. With the possible exception of higher incidences of caries and dental attrition among the Ban Chiang sample, dental pathology for the two samples is similar. The size of teeth in the two samples is also about the same.

Utilizing an extremely objective multivariate statistical procedure, Mahalanobis' d-squared statistic, male crania from Ban Chiang are compared with four prehistoric Southeast Asian samples using thirteen cranial measurements (Figs. 9, 10, 11). The samples include Ban Chiang, Non Nok Tha, Ban Kao (a late Iron Age site in western Thailand), and two Neolithic samples from Laos and Vietnam. The Non Nok Tha and Ban Kao samples are preserved in the Sood Sangvichien Prehistoric Museum and Laboratory of the Siriraj Hospital and Medical School, Dhonburi, Thailand. The two Neolithic samples from Indochina are preserved in the Musée de l'Homme, Paris. A clustering analysis of these results produces the diagram in Fig. 12. Ban Chiang is found to cluster with the two Neolithic samples from Indochina which then join a loose cluster formed between Non Nok Tha and Ban Kao.

In summary, these comparisons would indicate that, while there are similarities between Non Nok Tha and Ban Chiang, there are equally provocative affinities between Ban Chiang and the Neolithic samples from Indochina.

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Diagram of relationship based on a clustering analysis of Mahalanobis' d-squared statistic results using 13 cranial measurements recorded on 5 prehistoric Southeast Asian samples.

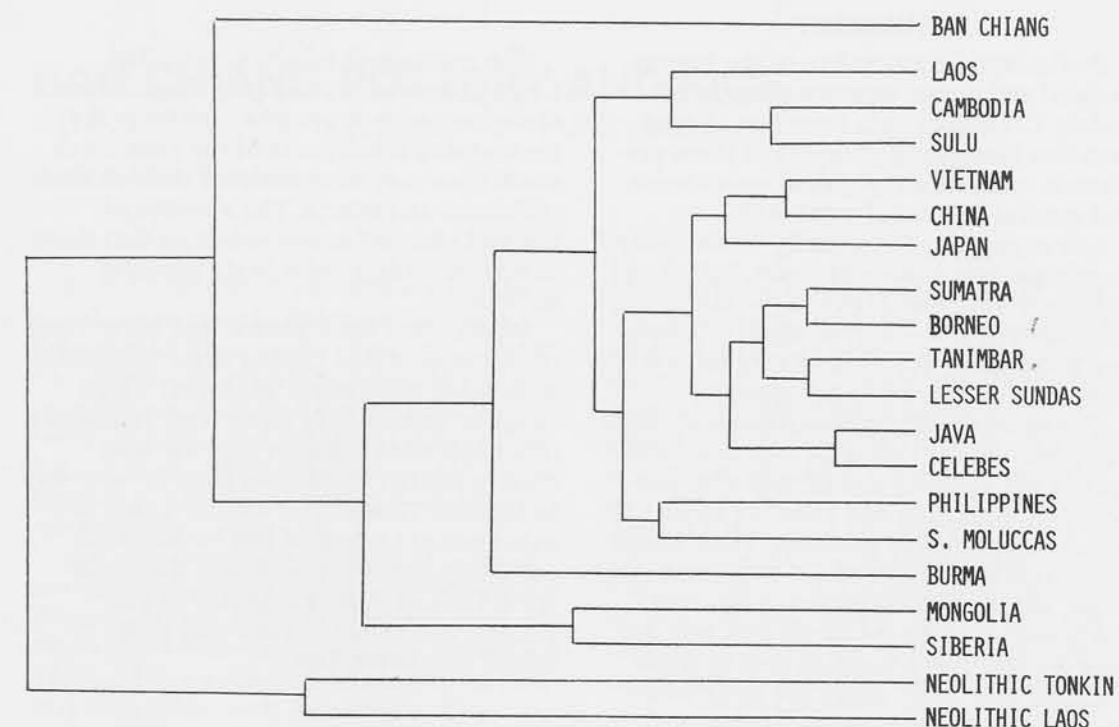


COMPARISONS WITH NEAR CONTEMPORARY INHABITANTS

Enlarging the just described comparisons, additional multivariate statistical procedures are applied to two general categories (metric and non-metric) of skull variation. In these comparisons 21 cranial measurements and 24 non-metric cranial traits recorded on three prehistoric and eighteen near contemporary samples representing mainland and island Southeast Asia and the Far East are utilized. Figures 13 and 14 summarize the results.

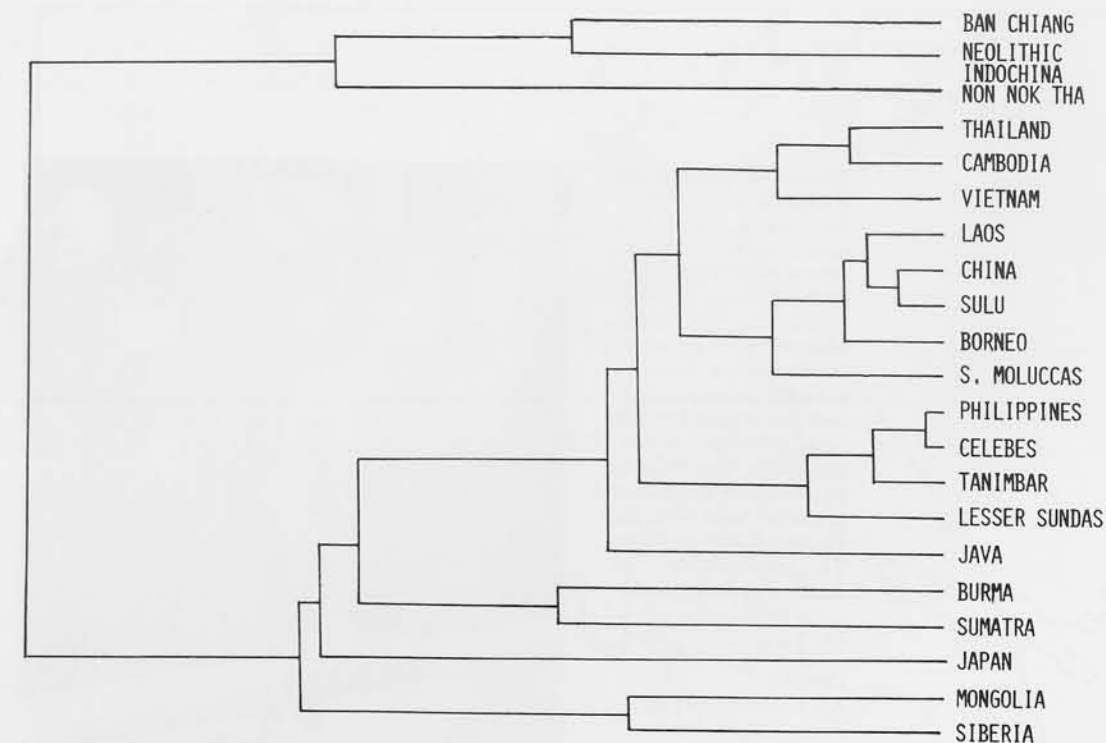
While the differences occur, there is sufficient agreement in both comparisons to warrant the conclusion that the Early Metal Age inhabitants of Ban Chiang are related to other prehistoric Southeast Asian (especially Indochinese) samples. Furthermore, Ban Chiang is equally close to a great many near-contemporary island Southeast Asian samples, an observation which is particularly underscored by the metric results. Non-metrically, Ban Chiang also shows similarities to several near-contemporary samples from mainland Southeast Asia and East Asia (e.g., Laos, Vietnam, China).

These suggested associations may represent possible long-term historical biological connections which have resulted from various movements of people originating in late Pleistocene times when many of the existing islands of Indonesia formed a continuous landmass with the existing Asiatic mainland. Quite conceivably, then, the ancient inhabitants of Ban Chiang may represent some of the earliest ancestors of a people who would eventually populate the vast Pacific domain, one of the last regions of the world to be settled by prehistoric man.



13 Diagram of relationship based on a clustering analysis of Mahalanobis' d-squared statistic results using 21 cranial measurements for 20 male samples.

14 Diagram of relationship based on a clustering analysis of distances using 24 non-metric cranial traits recorded on 21 male samples.



SUMMARY

Preliminary examination of the human skeletal and dental remains of approximately 123 individuals from Ban Chiang provides interesting glimpses of these prehistoric inhabitants' physical appearance and general pattern of existence.

Life expectancy, at least by modern-day standards, was a mere 31 years. Infant and child mortality was high but the later occupants of the site lived slightly longer and had slightly lower mortality rates when compared to the earlier occupants.

The reconstructed physiognomy of these early inhabitants indicates they were moderately tall statured and of muscular proportions. Squatting and kneeling appear to have been preferred postures. Their heads were large and rather broad with prominent faces. Moderate to extensive tooth wear, the presence of dental caries and gum disease are relatively common among these remains. The teeth, while not large when compared with other series (living or extinct), are slightly larger in the earlier occupants of the site.

The prehistoric inhabitants of Ban Chiang presumably suffered diseases and disorders, such as anemia, similar to the present-day inhabitants of the area. Such conditions may have assisted them in their resistance to malaria. The absence of marked trauma further indicates that these early inhabitants led a fairly peaceful existence.

While it has been shown that the ancient inhabitants of Ban Chiang show similarities with other prehistoric Southeast Asian samples, particularly those from Indochina, other evidence suggests they are also closely related to samples from present-day Indonesia. These latter affinities may indicate ancient biological ties between the early inhabitants of mainland Southeast Asia, such as those excavated at Ban Chiang, and those found living today in island Southeast Asia.

Michael Pietrusewsky was educated at the University of Toronto and is currently a professor of physical anthropology at the University of Hawaii, Manoa. He is an expert on Southeast Asian skeletal populations and has studied these collections in various museums. Specifically, he analyzed the skeletal material from both Ban Chiang and Non Nok Tha. He has also studied skeletal materials from many sites in Oceania.

Credits

All photographs by Peter Gilpin; line drawings by Oster Wong.



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