An Osteological Perspective on the Origins of the Modern Thai

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The controversy surrounding Thai origins and movements has continued for many decades. The debate can be summarized in two hypotheses: the "immigrant" and "endogenous" hypotheses. Statistical analyses of multiple comparison tests reveal that craniofacial metric traits of the modern Thai sample differ more significantly from archaeological and modern Chinese samples than they do from the archaeological Thai sample.

This paper focuses on the assessment of population affinities based on craniofacial skeletal data. The main objective of this research is to test two hypotheses, i.e. the "immigrant" and "endogenous" hypotheses. The former proposes that the main stream of the Thai migrated from China, while the latter favors the concept that the modern Thais are descended from prehistoric inhabitants of present day Thailand. Although there is much research in East and Southeast Asia using historical and linguistic data[1] regarding the two hypotheses, the use of skeletal morphology to solve the problem of Thai origins has been almost entirely excluded.[2]

The argument for Thai migration is based largely on historical records. Thai history prior to the thirteenth century A.D. has been distorted since Borihanthepthani (1968) claimed that after the movement of Thai from the Altai Mountain (7,000 years B.P.), the last mass migration was from Yunnan, China (1,300 A.D.). This information has been supported by Thai authority until the present (Tourism Authrority of Thailand n.d.). There is no direct evidence of any major population movement from China to Thailand during the early second millennium A.D. (Tu and Chen 1978).

The problems of Thai origins and migration are reflected in linguistic taxonomy. Tai languages have been categorized under the different language phyla: Austroasiatic, Sino-Tibetan, and Austro-Tai (Thurgood 1985; Edmonson and Solnit 1988). The Austro-Tai hypothesis proposed by Benedict (1942) is widely accepted by most linguists working in the area today (Reid 1988). Modern Thai or Siamese is included in the Tai language family (see Figure 1).

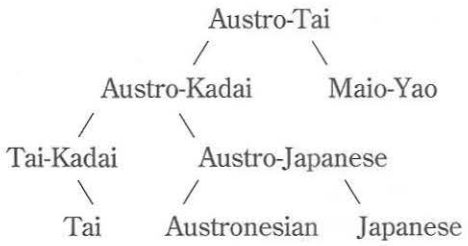


Figure 1 The Austro-Tai language family-tree (Adapted from Thurgood 1985).

Although linguistic data suggest that the greatest linguistic diversity of Tai-Kadai was in Southeast China (Edmonson and Solnit 1988), it is not always true that the most diverse area is the point of origin (Lehman 1963). Benedict (1975) postulates the direction of cultural influence from Southeast Asia to China based on linguistic evidence; and his viewpoint has been supported by human dental remains (Turner 1989). Mainland Southeast Asia is, therefore, another possible homeland for Austro-Tai.

The archaeological evidence in Thailand also shows gradual cultural change; there is no sign of a sharp-break or evidence of intruders between 3,600 B.C. and 300 A.D. (see Table 1). The cultural and physical remains reveal continuous occupation of the area for many millennia.

Table 1

Archaeological Evidence from Selected Sites in Thailand

Age	Location	Cultural Remains	Sources
A.D. 1,400	North & Central	Stone inscriptions	(5)
A.D. 600–700	Northeast & Central	Iron, Salt, Fortified mound	(8); (9)
2,000–1,400 B.C.	Kok Panom Di	Grave goods, Rice	(4)
3,600 B.C.–A.D. 300	Ban Chiang	Pottery, Rice,	(3); (11)
	Non Nok Tha	Copper base metallurgy	(2)
	Ban Na Di		(4)
6,290–5,705 B.C.	Ban Chiang	Hearth (?)	(11)
3,600 B.C.–A.D. 700	Banyan Cave	Rice husks	(3)
5,500–3,600 B.C.	Pah Chan Cave	Pottery	(3)
9,000–5,500 B.C.	Spirit Cave	Core stone tools	(3)
0.03–0.04 mya	Lang Rongrien Cave	Flake stone tools	(1)
	Moh-Khiew Cave		(6)
0.8±0.3/0.6±0.2 mya	Mae Tha	Core stone tools	(7); (10)

Sources: (1)Anderson (1987); (2)Bayard (1979); (3)Gorman (1969); (4)Higham (1989); (5)Chit (1981); (6)Pookajorn, et al. (1991); (7)Pope, et al. (1986); (8)Smith (1979); (9)Solheim & Ayres (1979); (10)Sorensen (1985); (11)White (1986).

Cavalli-Sforza and colleagues (1988) and Poolsuwan (1991) report a closer genetic relationship between Thai and Austroasiatic Khmer than between Thai and Chinese migrants (see Sirijaraya 1988).

Therefore, an alternate possibility, that the Thai derive from aboriginal tribes or native people of the area, has been proposed to counter the traditional viewpoint that Thais originated from China. While the previous debates are based heavily on cultural remains, I think the question "Who are the ancestors of the modern Thai?" cannot be properly addressed without the direct evidence of the populations themselves. Skeletal remains are, therefore, my choice in reconstructing the relationships of the past and present populations.

The main focus of this study is to test the hypothesis that modern Thais are more closely related to early people in China than early people in Thailand. If early Thais migrated from China to settle within the contemporary boundary of Thailand, modern Thais should be more similar morphologically to archaeological Chinese. On the other hand, if modern Thais derived from early indigenous people in Thailand, modern Thais should be more similar to archaeological Thais than to archaeological Chinese.

This study, therefore, uses skeletal morphological methods for measuring population migration. The skull is considered the best skeletal portion in measuring the biological relationships of human populations (Gill 1986; Pietrusewsky 1981). The facial portion, especially, is considered to have a stronger genetic component than other parts of the skull — base and calvaria (Hershkovitz, et al. 1990). For this reason, more facial traits were selected for this study than other cranial traits. They are referred to as craniofacial traits throughout the paper.

This paper focuses on Anthropometry as a reliable method for measuring population affinities. Since only metric traits have been known to give similar results of biological distance as serological indicators (i.e. the ABO, MN, Rh series, taste reaction and color blindness factors) (Sanghvi 1953), I have thus selected the method of metric traits to present here. Many measurements could not be taken from the archaeological skeletal populations, however, due to the incompleteness and fragility of long buried bones.

Material & Method

The sample drawn consists of 307 cases, including 125 modern Thai (37 females, 72 males, and 16 unknown sex)[3], 70 modern Chinese (20 females and 50 males), 46 prehistoric Thai (17 females and 28 males), and 66 prehistoric Chinese (25 females and 41 males)[4] (see Table 2). Only adults are used for the analyses.

Fourteen craniofacial metric traits were finally selected to use in this study. They were selected for different reasons. Most of the selected metric traits are traditional measurements that were reported as conveying meaningful variation in phylogenetic studies (Giles 1976) and as major variants with geographic variation among closely related populations (Hanihara 1985a, b).

The fourteen metric traits are maximum cranial length, maximum cranial breadth, bizygomatic breadth, facial height, facial breadth, nasal height, nasal breadth, orbital height, orbital breadth, biorbital breadth, interorbital breadth, and the three malar bone measurements (frontomalare orbitale to superior zygomaxillare, frontomalare orbitale to inferior zygomaxillare, and superior zygomaxillare to inferior zygo-maxillare) (see Figures 2, and 3).

Table 2

Thai and Chinese Skeletal Population Samples

Population	No. of Female	No. of Male	No. of Unknown Sex	Total	Sources
Modern					
Thai	5	10	0	15	AMNH
	24	28	0	52	Siriraj Hospital
	8	34	16	58	Suan Dok Hospital
Total	37	72	16	125	
Chinese	5	12	0	17	Siriraj Hospital
	1	4	0	5	Field Museum
	14	34	0	48	AMNH
Total	20	50	0	70	
Prehistoric					
Thai	8	11	1	20	Siriraj Hospital
	9	17	0	26	UNLV
Total	17	28	1	46	
Chinese (N.)	21	36	0	57	(1); (2); (3); (4)
Chinese (S.)	4	5	0	9	(5)
Total	25	41	0	66	

Note: AMNH is abbreviated from American Museum of Natural History, New York, USA. Siriraj Hospital is located in Bangkok, Thailand. Suan Dok Hospital is located in Chiang Mai, Thailand. Field Museum of Natural History is located in Chicago, Illinois, USA. UNLV is abbreviated from University of Nevada, Las Vegas, USA.

Sources: (1)Yan, et al. 1960a, 1960b; (2)Yan 1962; (3)Yan 1972; (4)Yan 1973; and (5)Zhang, et al. 1977.

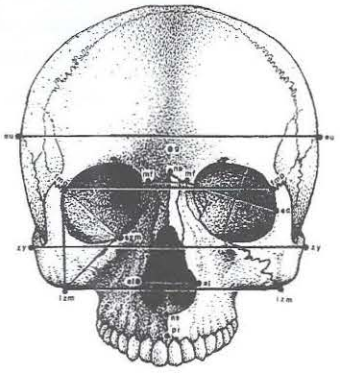


Figure 2 Morphological landmarks for the cranio-facial metric traits (frontal view).

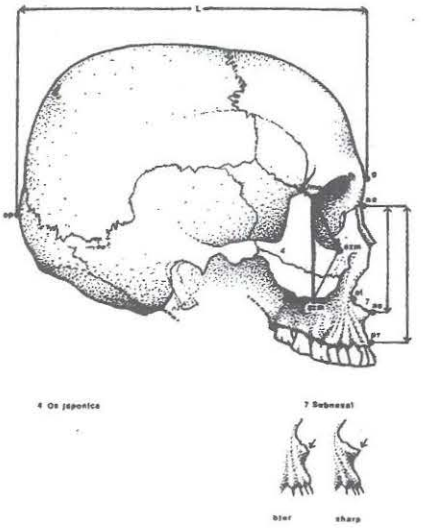


Figure 3 Morphological landmarks for the cranio-facial metric traits (Lateral view).

Results

Paired-sample t-tests between measurements of left and right anatomical sides of Thai and Chinese skulls were performed to determine the data set to be used. Statistical analyses of the metric data include univariate analysis of the mean and standard deviation. Skewness was determined using stem and leaf plots as well as boxplots to check on the normal distribution and to check for clerical errors.

The descriptive statistics are summarized in Tables 3 and 4. The craniofacial metric traits were analysed by different statistical methods, i.e. the Tukey HSD multiple comparison test, principal components analysis, and path analysis. The results of this study support the model indicating the closest relation between modern Thai and archaeological Thai (see Table 4).

Archaeological Thai appear more closely related to modern Chinese than modern Thai (see Table 4). This result supports Benedict's linguistic hypothesis of cultural influence from Southeast Asia to China (Benedict 1975). It also gives further support to Turner's dental hypothesis proposing that Sundadonts (Southeast Asian dental characteristics) gave rise to Sinodonts (Chinese dental charateristics) (Turner 1989).

Finally, craniofacial skeletal patterns change through time, as revealed through principal components analyses (see Figure 4). The trend is toward a smaller version of the modern populations as compared to larger craniofacial elements of the archaeological populations.

Discussion and Conclusion

Different statistical analyses of craniofacial metric data in this study indicate that modern Thais show the closest relationship to archaeological Thais. However, Path analysis indicates that the potential ancestral groups of modern Thai are not all included in the hypothetical groups in this study (see Figure 5). Only speculation, based on other sources (Pietrusewsky 1978), supports the possibility that ancestral groups for modern Thais include other archaeological Southeast Asians.

Table 3

Summary Descriptions of Craniofacial Metric Traits for Male and Female Modern and Archaeological Thai and Chinese Groups

	Thai						*Chinese*					
	modern			**archaeological**			**modern**			**archaeological**		
	x	*SD*	*n*	*x*	*SD*	*n*	*x*	*SD*	*n*	*x*	*SD*	*n*
Cranio-Facial trait												
G-OP	169.69	8.16	106	178.38	10.93	29	174.46	8.16	65	173.59	11.27	54
EU-EU	140.94	6.77	90	139.40	5.85	30	138.55	5.39	65	144.71	6.71	56
NA-PR	66.51	5.35	88	68.35	4.72	17	69.34	4.98	65	71.40	5.43	61
ZY-ZY	130.10	7.56	108	135.22	6.97	9	131.74	6.43	65	136.01	5.56	36
FMO-FMO	95.47	5.04	108	96.72	4.42	27	95.42	4.58	65	97.73	3.67	51
FMO-SZM	31.04	1.90	105	32.84	2.48	32	32.32	1.94	65	-	-	0
FMO-IZM	43.20	3.41	105	45.88	2.65	30	45.06	3.19	65	-	-	0
SZM-IZM	32.12	4.01	103	30.28	3.61	30	34.29	3.77	65	-	-	0
NA-NS	50.20	3.73	109	51.06	3.00	16	52.55	3.52	65	53.49	3.75	59
AL-AL	25.63	2.32	109	27.97	2.11	17	25.47	1.86	65	27.04	2.24	58
ORB-H	33.25	1.93	109	33.63	2.33	19	34.29	2.02	65	33.88	1.95	63
ORB-B	40.59	2.51	108	40.41	3.24	16	40.26	2.22	65	42.53	2.09	64
INT-OR	18.42	2.08	109	21.52	2.11	23	19.87	1.92	65	18.58	2.27	61
MAX-MAX	99.25	6.08	30	98.80	5.17	5	98.72	4.86	60	104.48	6.04	52

Note: See Nakbunlung (1994) for a detailed description of each craniofacial trait.

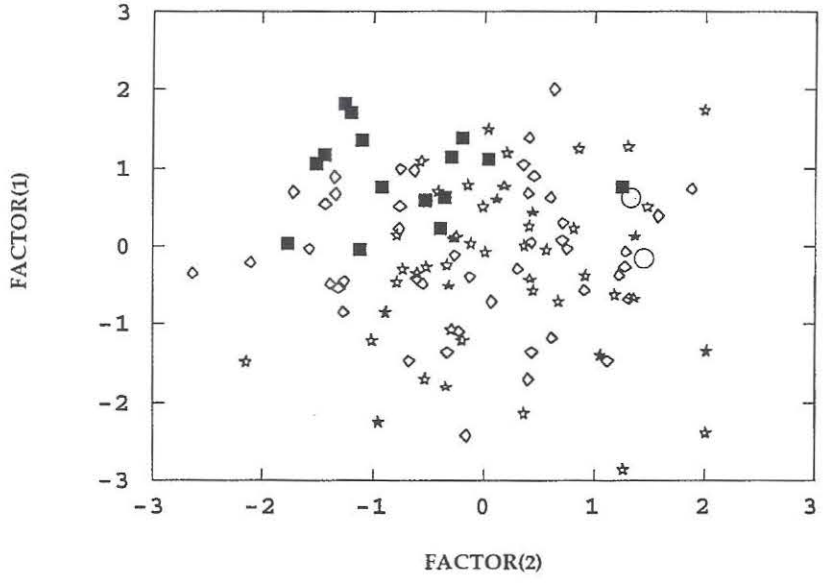
Table 4

Summary Comparisons of Craniofacial Metric Traits for Modern and Archaeological Thai and Chinese Groups Using the Tukey HSD Multiple Comparison Tests

	AC/ MT		AC/ MC		AT/ MT		AT/ MC	
	m	f	m	f	m	f	m	f
Cranio-Facial trait								
G-OP	"	"	"	"	*	*	"	"
EU-EU	"	*	*	*	"	"	"	"
NA-PR	*	*	*	"	"	"	"	"
ZY-ZY	*	*	"	*	"	*	"	"
FMO-FMO	"	*	"	*	"	"	"	"
NA-NS	*	*	"	"	"	"	"	"
AL-AL	*	"	*	"	*	*	*	"
ORB-H	"	"	"	"	"	"	"	"
ORB-B	*	*	*	*	"	"	"	"
INT-OR	"	"	"	*	*	*	*	"
MAX-MAX	*	*	*	*	"	~	"	~
FMO-SZM	~	~	~	~	*	*	"	"
FMO-IZM	~	~	~	~	*	*	"	"
SZM-IZM	~	~	~	~	"	"	*	*

Note: AC = Archaeological Chinese, AT = Archaeological Thai, MC = Modern Chinese , MT = Modern Thai, and m = male, f = female (male and female are tested separately).

" all comparisons tested are insignificant.
* the statistical significance level is less than 0.05.
~ comparisons are not made due to insufficient cases.



Circle	=	Archaeological Thai
Star	=	Modern Thai
Square	=	Archaeological Chinese
Diamond	=	Modern Chinese

Figure 4 First and Second Component Scores Plots for Male Groups.

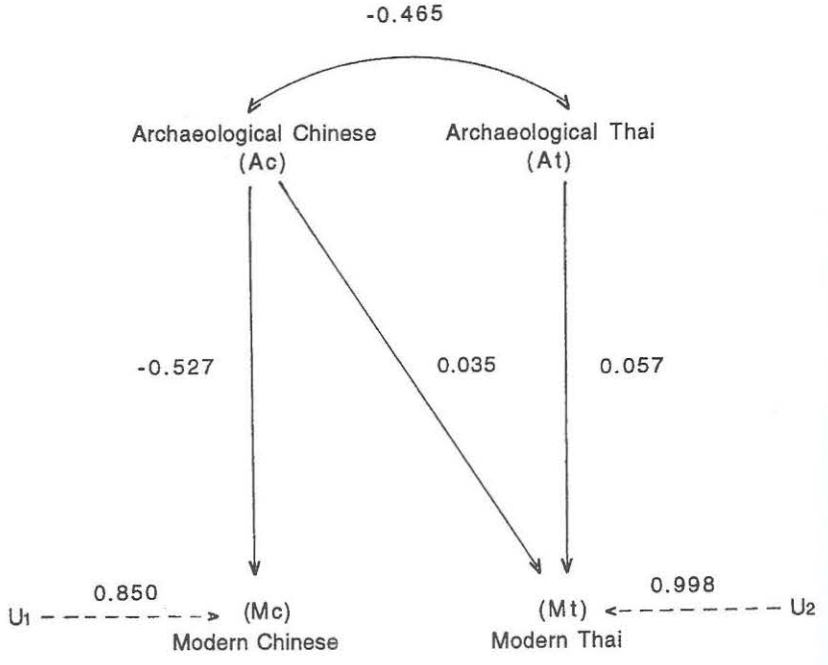


Figure 5 Path diagram of Thai origin (male).

The osteological perspective has significant implications for the study of past and present population relationships because it provides direct evidence to add to the indirect evidence from cultural sources. Previous studies of Thai population movements have been based solely on cultural remains. The significance of this study is to call attention to the fact that skeletal remains should not be treated as unwanted items. Skeletal attributes contain abundant information if one knows how to access that information.

However, this study is limited to only four groups, modern and Archaeological Thai and Chinese. The result refutes the hypothesis that modern Thais have descended from populations which had immigrated to Thailand from China, but fail to clearly support the hypothesis that modern Thais are descended from indigenous groups in Thailand. In other words, the results of this study indicate that the immigrant hypothesis and the endogenous hypothesis are not mutually exclusive. Therefore, samples of neighbouring populations are needed for further analysis of the origins of the modern Thai.

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Notes

[1]Please see details in many papers presented at the Thai Studies International Conference which was held in the Republic of China during May 11-13, 1990.

[2]Professor Dr. Sood Sangvichian (1978) introduced the osteological comparative studies for studying the problems of 'The Origin of the Thai' in his book: *The Problem of Thai Migration.*

[3]It is not an easy task to do sex estimation from only the skull, therefore some of them were marked 'unidentified.'

[4]Data for 66 Neolithic skulls were taken from published accounts (Yan et al. 1960a, b; Yan 1962, 1972, 1973; Zhang et al. 1977).

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