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Morphological affinities of the first Americans: an exploratory analysis based on early South American human remains

The cranial morphology of early South American human remains are compared with Late Pleistocene and Early Holocene worldwide human morphological variation by means of a principal components analysis applied to 13 craniometric variables. Two modern Mongoloid populations and one Australoid population were also included as controls. The morphological affinities obtained showed evidence of a marked biological similarity between early South Americans and early and modern Australians, and a considerable distance between both populations and the Mongoloid groups used as control. These results call for more detailed investigations about human micro-evolution in the Americas, including time of entry and number of migrations involved.

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Introduction

In the last decade, the debate around the origin and affinities of the first Americans has generated hundreds of publications in the fields of genetics (Laughlin & Harper, 1979; Harper, 1980; Nei & Roychoudhury, 1982; Salzano, 1984; Szathmary, 1984; Williams *et al.*, 1985; Kirk & Szathmary, 1985; Salzano & Callegari-Jacques, 1987; Black *et al.*, 1988; Cavalli-Sforza *et al.*, 1988), archaeology (Bryan, 1978; Shutler Jr, 1983*a*; Owen, 1984; Irving, 1985; Guidon & Delibrias, 1986; Gruhn, 1987; Adovasio & Carlisle, 1988), linguistics (Greenberg *et al.*, 1986; Gruhn, 1988; Nichols, 1990), and quarternary research (Hopkins *et al.*, 1982). However, the study of cranial morphology of the first inhabitants of the continent has not added any significant contribution to the debate. Consequently, most of the assumptions regarding settlement of the Americas relies on information about genetic variation of modern Amerindians, on dental variation of extinct and extant native populations, on radiometric dates of archaeological sites, and on paleoclimatic reconstruction of Beringia.

In a previous publication (Neves & Pucciarelli, 1989) we investigated the extra-continental biological affinities of three series of Paleoindian and Early Archaic South American human remains by comparing the cranial morphology of the series with those described by Howells (1973). Our investigation was carried out by applying a principal components analysis on size-and-shape and shape information alone. In both cases the three series exhibited an unexpected biological relationship with modern Australoids.

The cranial morphology of the same early South American skeletal remains are compared here with that of Late Pleistocene and Early Holocene hominids from Asia, Europe, Africa and Australia. The aim of the present work is to verify if the pattern of morphological association detected in our previous experiment can also be achieved if the first South Americans are compared with their contemporaries of the Old World.

Materials and methods

The materials used in this work comprise three series of prehistoric South American skeletal remains, identified as Tequendama, Lagoa Santa Sumidouro, and Lagoa Santa Composite.

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They are male individuals recovered from Paleoindian and Early Archaic horizons of Colombia and Brazil. General information about the series is presented in Table 1.

Tequendama is a complex of archaeological sites located 18 km southwest of Bogotá, Colombia, and was excavated in 1970. The results of the excavations were presented by Correal & Hammen (1977). Several carbon-14 dates established the age of Tequendama I and II (the sites excavated) at between 10,920 ± 260 and 2225 ± 35 BP. A total of 26 skeletons was recovered, but in this work only the eight skeletons dated between 9000 and 6000 BP are used.

Calcareous caves and rock shelters of the Lagoa Santa region have attracted naturalists, paleontologists, and archaeologists since the mid-1800s because of the abundance of animal and human fossils (Laming-Emperaire *et al.*, 1975). Lund (1839, 1840, 1845) was the first to recognize the importance of the area for the understanding of animal and human evolution in South America. From 1832 to 1888 he explored several caves in Central Brazil, including Sumidouro Cave, which was the focus of several further paleontological explorations. Although Sumidouro has never been systematically excavated or dated by radiometric techniques, Lund (1850) demonstrated a clear stratigraphic association between the extinct Pleistocene fauna and the human remains he recovered from the site. Since the 1950s the area of Lagoa Santa has been explored by scientific archaeology (Hurt, 1960, 1964; Hurt & Blasi, 1969; Laming-Emperaire *et al.*, 1975; Prous, 1978, 1980; Laming-Emperaire, 1979). The radiometric dates obtained by Laming-Emperaire (1979) for the cave of Lapa Vermelha clearly indicate that the area was occupied at least by 12,000 BP. Similar sites in the same area, or near by, have also provided ancient dates such as 11,960 ± 250 BP (Santana do Riacho), and 9720 ± 128 BP (Cerca Grande) (Schmitz, 1984). All these findings point to a strong Paleoindian and Early Archaic component in the Lagoa Santa area. In accordance with Mello e Alvim (1977) the skeletal remains recovered from these sites suggest a marked biological continuity for the local population from the Paleoindian until the Late Archaic period.

Considering the evidence cited above, the skeletal remains recovered by Lund at the site can be expected to cover the period between 12,000 and 8000 BP (Prous, personal communication). For the purposes of our study, the skeletal material from Sumidouro Cave will be considered to be associated with the Paleoindian and Early Archaic horizons.

The Lagoa Santa Composite series is composed of human remains recovered by different scholars from six different sites of the Lagoa Santa region (Sumidouro, Confins, Lapa do Caetano, Lapa de Carrancas, Cerca Grande and Lapa das Boleiras). Similarly, the best time span estimate for this series is 12,000 to 6000 BP.

The craniometric information regarding Tequendama was obtained in the literature, thanks to detailed morphological characterizations presented by Correal & Hammen (1977) whose tables allowed for the compiling of the metric information on an individual basis.

The information of the Sumidouro series was collected by one of us (W.A.N.) at the Zoological Museum, Copenhagen and at the Natural History Museum, London, in 1988. Individual information for Sumidouro can be found in Neves (1989). Data regarding the Composite series was gathered from the Brazilian anthropological literature (D'Ávila, 1950; Messias & Mello e Alvim, 1962). In order to minimize inter-observer error, the two Lagoa Santa series were kept separately.

The data we used for comparison regarding the morphological variation of early *sapiens sapiens* of the Old World were obtained from Habgood (1985), and are presented in Table 2. A skeletal series of modern Australoids (South Australians—SAUS) and two of modern

Table 1 **General information about the South American skeletal series used in the work**

Series Ident.	Abbreviation	*N*	Archaeological sites	Geographical localization	Absolute dates	Estimated dating	Main source
Tequendama	TEQU	5	Tequendama I, Tequendama II	Soacha County, Colombia	10,920 ± 260[1] to 2225 ± 35 BP	—	Correal & Hammen, 1977
Lagoa Santa Sumidouro	LASS	8	Sumidouro II (Cave)	Pedro Leopoldo County, Minas Gerais, Brasil	—	12,000 to 8000 BP	Lund, 1950
Lagoa Santa Composite	LASC	6	Sumidouro II, Confins, Lapa do Caetano, Lapa de Carrancas, Cerca Grande, Lapa das Boleiras	Pedro Leopoldo, Matozinhos, Vespasiano, and Lagoa Santa Counties, Minas Gerais, Brasil	—	12,000 to 6000 BP	D'Avila, 1950; Messias & Mello e Alvim, 1962

[1] Only the skeletons dated to between 9000 and 6000 BP were used.

Table 2 **Old Word Pleistocene and Early Holocene crania used for comparison (adapted from Habgood, 1985)**

Cranium	Abbreviation	Measurement source
Australia		
Early Australians mean[1]	EAUS	Thorne, 1976; Freedman & Lofgren, 1983; Thorne & Wolpoff, 1981
Keilor	K	Freedman & Lofgren, 1979
East and Southeast Asia		
Liujiang	LJ	Coon, 1962
Zhoukoudien Upper Cave 101	U101	Coon, 1962
Zhoukoudien Upper Cave 102	U102	Coon, 1962
Zhoukoudien Upper Cave 103	U103	Coon, 1962
Wajak 1 (old reconstruction)	W1	Coon, 1962
Africa		
Fish Hoek	FH	Coon, 1962
Afalou 9	A9	Stringer (pers. comm.)
Afalou 29	A29	Stringer (pers. comm.)
Taforalt 9	T9	Stringer (pers. comm.)
Taforalt 18	T18	Stringer (pers. comm.)
Western Europe		
Chancelade	CH	Morant, 1930
Solutré 5	SO5	Morant, 1930
Abri Pataud 1	AP1	Habgood (original data)
Le Placard 5	LP5	Habgood (original data)
Central Europe		
Oberkassel 1	O1	Habgood (original data)
Oberkassel 2	O2	Habgood (original data)
Eastern Europe		
Dolni Vestonicé	DV3	Jelinek, 1953
Brno 3	B3	Stringer (pers. comm.)
Mladec 1	M1	Habgood (original data)
Southwest Asia		
Hotu 2	H2	Habgood (original data)

[1] The Gracile and Robust means of Habgood (1985) were substituted by a general mean of early Australian fossils (Lake Mungo 1; Lake Tandou; Cohuna; Kow Swamp 1, 3, 5, 9, 14, 15).

Mongoloids (Buriat—BURI; Arikara—ARIK), as described by Howells (1973), are included in our analysis as controls.

Thirteen common craniometric variables (Table 3) could be identified among the traits analysed by the different authors involved. They are used as primary information for the biological analysis carried out in this paper (Table 4).

Biological affinities were investigated by means of a principal components analysis (Chatfield & Collins, 1980; Andrews & Williams, 1973) applied to a matrix of 28 cases by 13 variables. BMDP Statistical Software (Program P4M) was used for this purpose. The principal components were extracted from a correlation matrix, and no rotation was performed. The multivariate analysis relied on shape information alone. The removal of size influence

Table 3 **Craniometric variables used as markers**

Measurement[1]	Abbreviation
Glabello-occipital length	GOL
Basion-nasion length	BNL
Basion-bregma height	BBH
Maximum cranial breadth	XCB
Maximum frontal breadth	XFB
Nasion-prosthion height	NPH
Nasal height	NLH
Orbit height	OBH
Orbit breadth	OBB
Nasal breadth	NLB
Nasion-bregma chord	FRC
Bregma-lambda chord	PAC
Lambda-opisthion chord	OCC

[1] For definitions see Howells (1973).

was carried out through a Q-mode standardization, where the values of each original variable were divided by the object (individuals) arithmetic mean, calculated over all variables (Corruccini, 1973). The correction for size was undertaken before the data matrix entered the principal component extraction. An R-standardization of the variables was automatically performed by the BMDP-4M program during the extraction of the components.

The scores generated for the 28 cases corresponding to the first and the second principal components were plotted in a bidimensional coordinate graph to provide a visual representation of the morphological affinities of the objects involved.

Results

The results of the principal components analysis are presented in Tables 5, 6 and 7 and Figure 1.

Table 5 presents the cumulative proportion of the original variation explained by the first five principal components, while Table 6 shows the correlations between these complex variables and the initial metrical traits.

Although it is difficult to make a functional interpretation of the components generated, it is clear that the first two components aggregate important information from several variables, while each of the following two are strongly dominated by one specific variable, namely the glabello-occipital length in the case of the third component and the occipital cord in the case of the fourth. The fifth component summarizes residual information from most of the variables.

The principal coordinate graph of Figure 1 was based on the estimated scores presented in Table 7. The graph shows the distribution of the 28 cases analysed along the first and second principal components, which comprise 49% of the initial information.

The distribution of the 28 cases along the two axes attests to an unexpected biological association between the early South American series (LASS, LASC, TEQU) and the early (K, EAUS) and modern (SAUS) Australians included in the study. There is also a clear

Table 4 Craniometric data for the cases used in the work

Case							Variables						
label	GOL	BNL	BBH	XCB	XFB	NPH	NLH	OBH	OBB	NLB	FRC	PAC	OCC
K	197·0	109·0	142·0	144·0	122·0	71·0	51·0	30·0	41·0	27·0	114·0	121·0	105·0
EAUS	199·2	104·7	141·5	137·2	109·3	75·1	53·6	31·6	43·7	28·1	121·6	118·1	99·6
SAUS	190·3	102·0	129·6	131·9	110·1	64·8	49·7	33·5	41·9	27·9	111·9	116·6	92·1
LJ	189·0	103·0	135·0	142·0	125·0	66·0	46·0	29·0	38·0	27·0	117·2	118·0	91·5
U101	204·0	109·0	136·0	143·0	128·0	72·0	58·0	32·0	48·5	32·0	113·0	118·0	96·0
U102	196·0	117·0	138·0	140·0	117·0	69·0	46·5	32·0	40·5	26·0	119·0	124·0	107·0
U103	184·0	108·0	138·0	133·0	123·0	70·0	48·0	31·5	43·5	25·5	108·0	122·0	95·0
W1	191·0	109·0	129·0	151·0?	130·0	66·0	52·0	36·0	43·0	30·0	119·0	113·0	91·0
BURI	181·8	101·9	132·6	155·0	126·5	74·5	56·9	35·9	41·5	28·5	113·5	109·7	94·6
FH	198·0	94·0	130·0	150·0	121·0	51·0	43·0	31·0	37·0	25·0	123·0	126·0	90·0
A9	189·0	100·0	142·0	152·0	127·0	71·0	53·0	30·0	41·0	25·0	118·0	121·0	100·0
A29	185·0	98·0	127·0	137·0	119·0	62·0	46·0	31·1	38·0	27·0	110·0	118·0	95·0
T9	197·0	113·0	149·0	139·0	121·0	71·0	55·0	32·4	42·0	27·0	109·0	130·0	101·0
T18	182·0	98·0	130·0	135·0	113·0	65·0	50·0	30·0	39·0	28·0	98·0	114·0	103·0
CH	194·0	113·5	148·5	137·5	115·5	78·0	58·0	31·9	39·0	26·0	115·5	127·5	97·5
SO5	182·0	98·2	123·5	147·5	121·0	58·0?	46·2	32·2	43·0	23·8	106·9	102·9	99·1
AP1	182·5	98·0	131·0	138·0	117·0	62·0	48·0	32·0	39·0	26·0	111·0	107·0	97·0
LP5	174·0	96·0	128·0	140·0	109·0	57·0	43·0	26·0	35·0	22·0	103·0	108·0	97·0
O1	195·0	103·0	138·0	144·0	114·0	62·0	51·0	30·0	43·0	24·0	114·5	118·0	103·0
O2	183·0	96·0	134·0	129·0	112·0	66·0	46·0	31·0	36·0	25·0	106·0	125·0	93·0
DV3	184·0	104·0	129·0	130·0	119·0?	64·0	51·0	31·0	37·0	24·0	103·0	123·0	97·0
B3	199·0?	104·0	139·0	141·0?	124·0?	66·0?	49·0	29·0?	40·0	25·0?	113·0?	125·0?	104·0?
M1	199·0	103·0	139·0	142·0	125·0?	70·0	49·5	31·0	39·0	25·0	114·0	118·0	104·0
H2	184·0	103·0	142·0	133·0	112·5	62·0	47·0	27·5	35·5	21·0	111·0	120·5	98·0
TEQU	186·6	97·5	134·3	128·4	103·8	68·8	50·0	32·8	38·3	24·8	110·5	119·0	106·0
LASC	185·5	103·8	134·5	132·8	108·3	62·0	51·0	32·0	39·3	24·0	112·2	113·3	100·0
LASS	188·1	102·0	138·8	132·3	114·5	64·0	48·5	32·8	41·0	23·8	113·6	116·8	102·8
ARIK	179·5	102·8	133·4	141·5	116·4	71·7	54·4	34·9	40·5	27·1	109·3	108·9	95·1

The values regarding EAUS, SAUS, BURI, ARIK, TEQU, LASC, and LASS are mean vectors calculated over 9, 52, 54, 42, 5, 6, and 8 individuals, respectively.

Table 5 **Variance explained by the first five principal components generated**

Principal component	Eigenvalue	Cumulative variance
1	3·8389	0·2953
2	2·4764	0·4858
3	1·5943	0·6084
4	1·1640	0·6980
5	1·1518	0·7866

Table 6 Correlation among the initial metric variables and the principal components generated

Original variable	PC1	PC2	PC3	PC4	PC5
Basion-bregma height	−0·757	−0·393	−0·269	0·000	0·000
Bregma-lambda chord	−0·749	0·000	0·000	−0·491	0·000
Nasal breadth	0·713	0·000	0·450	0·000	0·000
Orbit height	0·641	0·000	0·000	0·000	0·295
Orbit breadth	0·600	0·000	0·498	0·305	0·000
Nasion-prosthion height	0·545	−0·319	−0·494	0·000	0·348
Maximum frontal breadth	0·505	0·497	−0·310	−0·297	−0·488
Nasal height	0·420	−0·736	0·000	0·000	0·251
Nasion-bregma chord	0·000	0·626	0·000	0·000	0·594
Maximum cranial breadth	0·522	0·626	−0·424	0·000	0·000
Basion-nasion length	0·000	−0·571	0·000	0·000	−0·405
Glabello-occipital length	−0·408	0·457	0·679	0·000	0·000
Lambda-opisthion chord	−0·483	0·000	0·000	0·754	0·000

association between both groups and two of the Zhoukoudian Upper Cave individuals (U102, U103). No particular evidence of morphological affinity with the modern Mongoloid series used as a control (BURI, ARIK) can be observed in the graph.

Discussion and conclusions

The most recent studies about the genetic diversity of modern Amerindians exclude any non-Asian biological contribution to the formation of the Native American stock (Salzano & Callegari-Jacques, 1987; Harper, 1980; Szathmary, 1984; Salzano, 1984; Williams *et al.*, 1985; Black *et al.*, 1988), contrary to what was once thought when geneticists relied on fewer serological markers (Kirk, 1979; Nei & Roychoudhury, 1982). This view was recently validated by the comprehensive work of Cavalli-Sforza *et al.* (1988), using 120 loci as source of genetic information. As stated by Black *et al.* (1988), there is no doubt, presently, that the most economical model to explain the extant genetic diversity in the Americas is to assume a demic diffusion from north to south, starting in Siberia and ending up in the extremities of South America.

Dental variation also provides indisputable evidence for an Asiatic origin for the Amerindians. According to Turner (1983, 1984, 1987) and Greenberg *et al.* (1986) all extinct

Table 7 **Estimated scores for the 28 cases included in the analysis in accordance with the first five principal components**

Case label	PC1	PC2	PC3	PC4	PC5
K	−0·412	−0·137	−0·202	0·174	−0·771
EAUS	−0·041	−0·615	1·539	0·654	1·966
SAUS	0·467	−0·224	2·051	−0·339	0·782
LJ	0·007	1·264	−0·345	−1·548	−0·179
U101	1·434	−0·511	2·138	−0·499	−1·155
U102	−0·771	−0·203	0·332	0·058	−0·752
U103	0·030	−0·762	−0·068	−1·088	−1·462
W1	2·019	0·652	0·658	−1·028	−0·457
BUR1	2·830	−0·746	−2·615	−0·278	1·732
FH	−0·346	3·294	0·683	−1·023	1·505
A9	0·116	0·703	−1·608	0·109	0·304
A29	0·254	0·895	0·326	−0·630	−0·246
T9	−0·650	−1·516	−0·018	−1·064	−0·703
T18	0·175	−0·831	0·104	0·850	−1·314
CH	−0·757	−1·669	−0·446	−1·402	0·894
SO5	1·267	1·019	−0·144	2·192	−1·570
AP1	0·544	0·411	−0·025	0·799	0·160
LP5	−0·776	0·758	−1·503	1·053	−0·887
O1	−0·460	0·206	0·389	1·429	0·105
O2	−0·854	0·059	−0·055	−1·300	0·706
DV3	−0·408	−0·644	−0·193	−1·087	−1·081
B3	−0·865	0·646	−0·097	−0·002	−0·781
M1	−0·451	0·700	−0·310	0·474	−0·306
H2	−1·831	−0·093	−1·299	−0·314	0·268
TEQU	−0·813	−0·717	0·539	1·525	1·585
LASC	−0·421	−0·687	0·410	0·958	0·744
LASS	−0·549	−0·279	0·186	1·033	0·501
ARIK	1·263	−0·975	−0·430	0·295	0·410

and extant native Americans exhibit a sinodontic pattern of molar variation unique to mongoloid populations.

The three migration model suggested by Turner (1983), also based on dental variation, is thus gaining acceptance among scientists. More recently, the model was thought to be supported by genetic (Williams *et al.*, 1985) and linguistic (Greenberg *et al.*, 1986) information, as well. Accordingly, all Amerindians, with the exception of the Aleut-Eskimos and the Na-Denes, would have originated from a single migration. Most, if not all, of the biological variation of the American Indians would be the product of *in situ* diversification. This model, however, has raised strong opposition among certain scholars (Campbell, 1986; Laughlin, 1986; Szathmary, 1986; Weiss & Woolford, 1986; Nichols, 1990).

In terms of chronology, the predominating opinion among archaeologists is that the first entry of man into the Americas occurred not much before the close of the Pleistocene. This view is supported by the paleoenvironmental conditions of Beringia during the Wisconsian (Hopkins, 1979; Hopkins *et al.*, 1982) and by absolute dates of true archaeological sites from all over the continent. So far, archaeologists have been unable to present incontestable evidence for the presence of man in the Americas before 12,000 BP (Owen, 1984). In contrast, some archaeologists argue in support of an earlier entry of man into the Americas (Shutler, 1983*a*). Among the arguments used to support this latter view are the possible occurrence of a pre-Clovis industry in some parts of the continent (Bryan, 1983; Morlan,

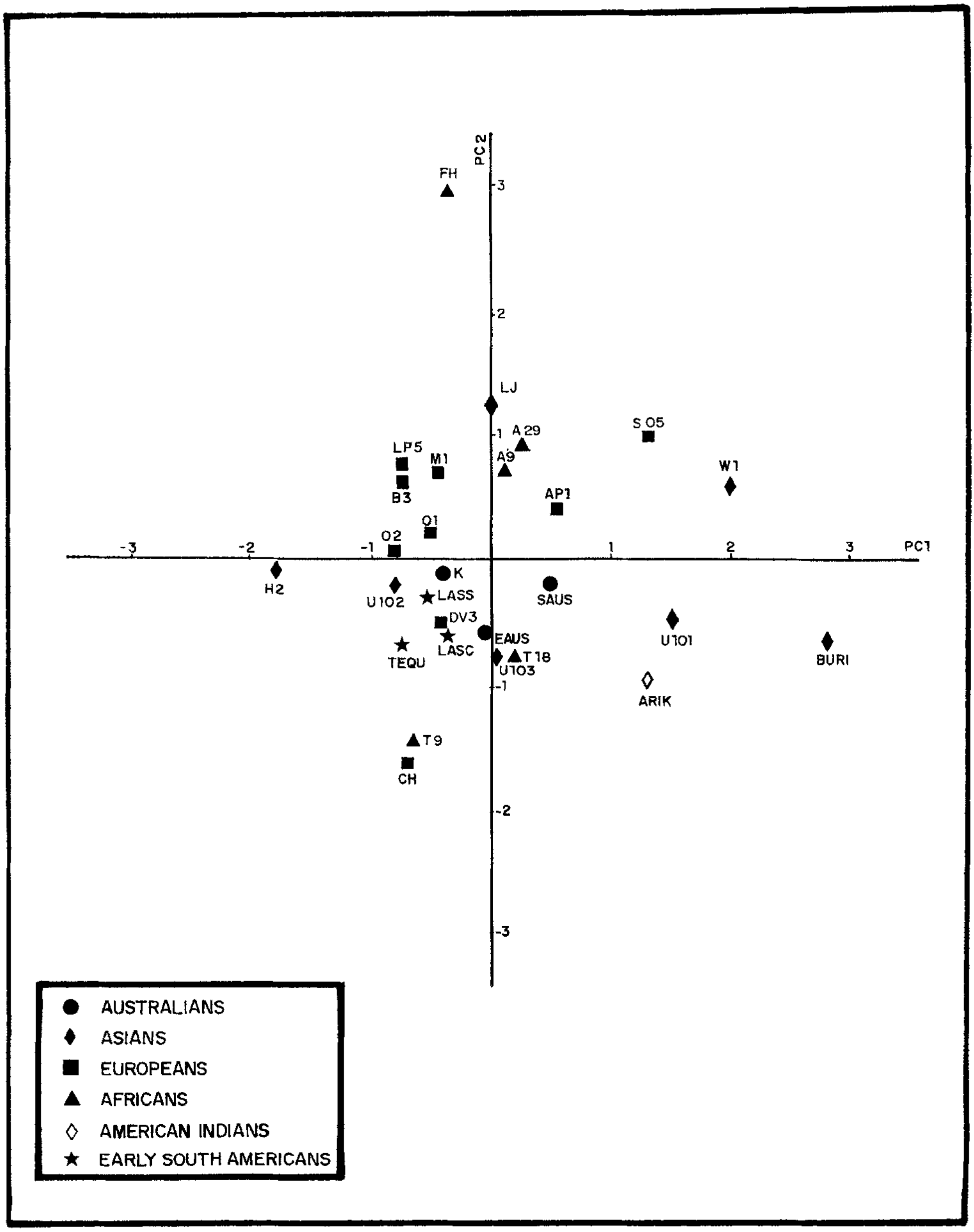

Figure 1. Plot of the 28 samples along the first and second principal components.

1983); the enormous technological diversification already present in the Americas by 12,000 BP (Bryan, 1978; Irving, 1985); and the availability of Pleistocene evidence said to be related to human activities dated by radiometric methods, especially in Central and South America (MacNeish, 1983; Dillehay, 1984; Guidon & Delibrias, 1986; Gruhn, 1988). A recent review about the degree of linguistic diversity in the Americas (Nichols, 1990) also supports the idea of an earlier entry of man into the continent.

In a previous paper (Neves & Pucciarelli, 1989) the cranial morphology of Lagoa Santa and Tequendama was compared with the modern worldwide cranial variation presented by Howells (1973). The comparison showed that early South Americans clustered very tightly with South Pacific populations, when size and shape were used as taxonomical criteria. When size was removed, the three series occupied an intermediate position between Mongoloids and Australoids in the statistical hyperspace.

The results obtained in this paper, namely, a marked biological affinity between the first South Americans and the first Australians, seem to corroborate our preliminary impression that when cranial morphology is used as anthropological marker there are some indications that the Americas were first occupied by pre-mongoloids. Much future work using new skeletal series, other classes of morphological traits, and quantitative analysis allowing for significance appraisal will be needed to confirm the biological relationships we detected in our pilot studies. The morphological evidence seems to indicate that the biological origins of the first Americans might have been more complex than genetic and dental variation have indicated so far.

Morphological affinities between early South Americans and early Australians do not necessarily involve a direct migration from the South Pacific to the Americas, as was argued by Rivet (1943). It is already well established that both the American and the Australian populations are genetically derived from an Asiatic common ancestral population (Kirk & Szathmary, 1985). In fact, as stated by Laughlin & Harper (1979, p. 7) "The Australian and American continents are the terminal ends of a great Pacific arc. The populations inhabiting them originally came from the Asiatic mainland, but they moved in opposite directions." The problem, in our opinion, is to establish the amount of independent evolutionary history the two populations had while in mainland Asia, after they moved southwards and northwards. The morphological affinities derived from our study can be perfectly matched to an Asian origin if we assume that Australians and Americans shared a common ancestor until just before they arrived at the New World. Accordingly, both branches, the one that migrated northwards and the one that migrated southwards, did not have a long, independent evolutionary history in northern and southern Asia prior to their settlement in the Americas and Australia. At least not enough to have changed their cranial morphology. If we accept the association detected in this study between Early South Americans, Early Australians and the Zhoukoudian Upper Cave people, Northern China can be suggested as the starting point of both migration branches. In fact an affinity between Early South Pacific populations and later Zhoukoudian people has already been suggested in previous independent studies (Thorne & Wolpoff, 1981; Wolpoff *et al.*, 1984; Habgood, 1985; Kamminga & Wright, 1988).

Would the existence of a pre-mongoloid human morphology in the Americas necessarily imply an earlier entry into the continent? Although it is at first suggestive of an earlier migration in the way suggested by Shutler (1983*b*), the final answer to this question depends on a better understanding of human evolutionary history in mainland Asia. The appearance and fixation of the mongoloid cranial morphology in the Old World is currently under close examination (Kamminga & Wright, 1988). Some anthropologists believe that the mongoloid pattern resulted from an ancient process of differentiation that could be traced back to the appearance of our sub-species in the region, during the Pleistocene (Thorne & Wolpoff, 1981; Wolpoff *et al.*, 1984; Wu & Zhang, 1985); others believe that there is no clear evidence of the mongoloid morphology in Asia before the Holocene (Kamminga & Wright, 1988). Much of this debate is due to the fact that a clear definition of what "mongoloid" means in terms of exclusive derived traits is still lacking in the literature. Consequently, the implications of our discovery to the time depth of the presence of man in the Americas depend on a better understanding of the final process of evolution of our species in Asia. As we stated elsewhere (Neves & Pucciarelli, 1989), if the mongoloid morphology was prevalent in East Asia much before the Holocene, our results indicate an earlier entry to the Americas than the conventional 12,000 BP normally accepted.

As can be perceived from the short review about the settlement of the New World presented earlier in this section, the cranial morphology of the early Americans has added very little if anything for generating and testing competing hypotheses about the origins of the American man, in recent years. This is totally incongruent with the importance played by morphological studies in other parts of the world in building hypotheses about the origin and spreading of modern humans (Smith & Spencer, 1984; Stringer & Andrews, 1988). One reason normally cited to explain the absence of comparative morphological studies in this context is that most human remains recovered so far in North America are of late antiquity (Taylor *et al.*, 1985). This prevents direct comparisons with the Old World Late Pleistocene and Early Holocene human morphological variation.

This is not necessarily the whole truth. The availability of human skeletons from the terminal Pleistocene and Early Holocene in South America allows for the investigation of the morphological affinities of the first Amerindians in an appropriate temporal framework. Most of this material is still lying in shelves of local museums and has not yet been adequately studied by well trained physical anthropologists with a wide view of human morphological variation during the Late Pleistocene.

In summary, we detected an unexpected biological affinity between early Australians and early South Americans by means of a principal components analysis applied to 13 craniometric variables. In a previous study (Neves & Pucciarelli, 1989) we demonstrated that when the first South Americans are compared to the modern worldwide cranial variation, they cluster more clearly with South Pacific populations than with Asian. These results, to say the least, raise new interesting questions about the evolutionary process of our species on the peripheries of the World.

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