积、埋葬学、考古内涵和测年给于生物考古学的联系，不因完整或不完整而对化石作个体的研究，则不难把山顶洞人看成是遍及全世界的解剖学上现代人的地区性人群微进化中的另一个早期粗壮系列。　　(韩康信译，尚虹校)

THE ZHOUKOUDIAN UPPER CAVE DENTITION

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Abstract

Past research by the senior author (Turner) indicates that Upper Cave Zhoukoudian specimens (Nos. 101, 102, 103) display a distinct dental morphological trait pattern known as Sinodonty, a dental pattern shared with other north Asian and north Asian-derived populations. Recently, the Sinodont designation was questioned, primarily on the grounds that the dental traits could not be assessed reliably from the available casts. The same three casts were again scored for trait data, this time by three observers of varying levels of experience, and in independent tests. Comparative observations support the reliability of the original scores on cast material, even when the most conservative scoring methods were utilized. The results agree with bioarchaeological evidence that the three specimens should be considered members of the same biological population. In addition, data lend support for proto-Sundadonty as the dental pattern ancestral to the Upper Cave Zhoukoudian Sinodont pattern.

Key words　Zhoukoudian Upper Cave, Sinodont dentition, Modern human origins

Much has been written in the last ten years about the origin of anatomically modern East Asians and their derived populations (Akazawa *et al.*, 1992; Brown, 1998, 1999?; Hanihara, 1994; Howells, 1995; Neves, 1998; Omoto, 1995; Pope, 1992; Turner, 1992a, 1992b; Wu, 1998; many others). In most articles, some consideration is given to the remains of the seven or more largely incomplete late Pleistocene individuals found in the Zhoukoudian Upper Cave (Black, 1934; Pei, 1934; Weidenreich, 1938—1939). Despite wartime loss of the original specimens, many observations and analyses have been made directly from casts produced in the 1930s, or analysts have used Weidenreich's published measurements and observations of the originals, or both (Brown, 1998; Howells, 1995; Kaminga *et al.*, 1988; Van Vark *et al.*, 1988; Wu, 1961, others). While all Upper Cave studies view the remains as anatomically modern, there is less certainty about the meaning of the

anatomical variation found in the three described and replicated cranial specimens —— 101, 102, and 103. Given the unceasing debate about the origin of anatomically modern humans, Upper Cave continues to be important.

There are also archaeological context and chronometric problems that remain unsolved even now. Taken together, these concerns involve deciding (1) whether the remains were intentionally buried or simply discarded as a result of one or more events, including possible violence; (2) determining their geological age; and (3) demonstrating whether all the individuals are of the same geological age, which would imply they were members of a single local population, or if many centuries are represented. If the latter is true, it might suggest memberships in more than one local or more distant population.

As for the first issue, Weidenreich (1938—1939: 162) felt the human remains represented some manner of funeral event, because the earth around the skeletal remains was sprinkled with hematite. The incompleteness of the remains indicated post-mortuary disturbance, which Weidenreich suggested was perhaps due to animals, later peoples, or earthquakes and landslides. He proposed that the group represented a family, with four of the seven individuals evidencing traumatic death, especially 101. These seven "family" members included one old male, one young adult male, two adult females, one adolescent, and two children (one 5 years old, the other possibly a neonate). Due to the minimal amount of cultural debris, Weidenreich (1938—1939: 163) concluded that the cave wherein they were discovered was not their home.

Weidenreich (1947) later suggested there may have been as many as ten Upper Cave individuals. Wu (1961) argued convincingly on the basis of tooth wear, occlusion, and jaw form, that mandible 104 does not belong to skull 102. Instead, Wu suggests that the jaw probably represents yet another adult female.

As for the second issue, dating, the Upper Cave humans were from the start considered to be ancient because the cave contained extinct fauna and types of cultural objects undiagnostic of Mesolithic or Neolithic times (Pei, 1934). Weidenreich (1938—1939: 161) was astonished at the "…unimaginable wealth of bones of fossil animals…" that numbered in the several thousands. Among these were hyena, bear, and ostrich that are today extinct forms. He offered no explanation for this vast paleontological accumulation, but he did conclude that the humans probably dated to the Upper Paleolithic. In addition to this relative date, absolute chronometry has been attempted, with dates ranging from about 11 000 B. P. to as much as 30 000 B. P. (Hanihara, 1994; Kaminga *et al.*, 1988, Brown, 1999?). At issue is the degree of association between the material actually dated and the human remains. While Kaminga and Wright (1988) favor the 11 000 B. P. C-14 assay of animal bone as the earliest possible date, a much earlier date of ca. 30 000 cannot be dismissed because the stratigraphic association of the date and the human remains is unclear (for discussion, see Brown, 1999?). Like Wu (1961, 1998), Turner (1985) sees the Upper Cave people as having been "Mongoloid" or "proto-Mongoloid" on the basis of his having found the Upper Cave teeth to possess the Sinodont dental pattern. Sinodonty is the dental

pattern found so far throughout all populations of Northeast Asia (excepting Jomon-Ainu) and the Americas, the latter of which were colonized by at least 11 500 years ago. Hence, a date earlier than 11 000 for the Upper Cave human remains is perfectly reasonable.

Thirdy, determining the amount of time represented in the depositioanl chronology of the human remains is today dependent mainly on the records of stratigraphy made during the actual excavation. This record seems to favor a brief interval. The presence of the hemitite covering the burial area, and limited spatial dispersal of the human remains within the cave would be the main lines of evidence for inferring both a short burial interval as well as the remains representing a single local group.

Undoubtedly, some of the discussion and controversy (scientific as well as "nationalistic") surrounding Upper Cave stems from Weidenreich's assigning typological or racial names to these crania. He considered No. 101 to be a primitive old male Mongoloid, although he allowed that measurements by themselves would align the skull with those of the European Upper Paleolithic. However, he identified four non-metric facial features that are rare in ancient and modern Europeans but well known for Asians and American Indians. These were pinched nasal bones, vertical cheek bones, a prenasal fossa, and maxillary alveolar prognathism. He viewed No. 102 as having an artificially deformed frontal bone, and being a female o Melanesoid appearance. She had received a penetration wound to her left temporal region and crushing blows to the vault, probably at or near the time of death, that distorted her vault. No. 103 was termed an Eskimoid female. These racial terms were applied after he made comparisons with modern crania from Melanesia, East Asia, and the Americas. In our view, Widenreich correctly recognized that the Upper Cave intra-group variation was exactly that which has long been recognized in Native American crania, thus, the racial names are meaningless. Other workers have noted that as a group, the Upper Cave people were simply "unmigrated American Indians" (Neumann, 1956; Stewart, 1960). To single out the "primitive Mongoloid" skull for assessing population or racial history, as Kaminga and Wright (1988) did, or the "Melanesoid" skull singled out by Brown (1998), strikes us as unsound on grounds of both evolutionary theory (populations are the unit of study, not individuals) and statistical method (selecting only part of an available sample). In both of these studies it is concluded that neither 101 nor 102 are especially "Mongoloid." It is interesting that 103, the Eskimoid female, has not been challenged as to her "Mongoloidness," nor did Kaminga and Wright, and Brown, heed or cite the advice given long ago by Neumann (1956) that the Upper Cave variation should be considered as simply the natural variability of this group.

The senior author (1985), like Weidenreich (1938—1939) and Wu (1961), has used all three Upper Cave crania together to make an odontological assessment of the groups affinity with recent and modern populations of the world. He and they found that as a group they aligned well with other northeast Asians and American Indians, both of whose pattern of dental crown and root morphological traits has been termed Sinodonty (Turner, 1983). Peter Brown (1998: 260) has in this journal recently dismissed that inference be-

cause he felt "…it is unlikely that the majority of his [CGT] dental traits can be reliably scored on the Upper Cave casts." In one sense his statement is correct because of the incomplete dental preservation or advanced wear in the three individuals. Very few of the full battery of traits were present for scoring. However, the statement misrepresents what can be inferred with only a few traits, and it is hoped that Brown's statement was not meant to imply that those traits that Turner did score were done so in an unreliable manner. Hence, the primary purpose of this communication is to assess whether or not Turner' original observations are unreliable.

1 Materials and Methods

It should be mentioned that not all of the traits included in the Arizona State University Dental Anthropology System (ASUDAS) (Turner, Nichol and Scott, 1991; Scott and Turner, 1997) are needed to define Sinodonty, Sundadonty, or the dental pattern of any other major geographic region. In fact, a small set of eight key traits will distinguish samples of Sinodont and Sundadont teeth. These include upper central incisor shoveling, upper central incisor double-shoveling, one-rooted upper first premolars, upper first molar enamel extensions, peg/reduced/congenital absence upper third molars, lower first molar deflecting wrinkle, three-rooted lower first molars, and four-cusped lower second molars (Turner, 1990). Even fewer traits are needed to distinguish Sinodonty from the European, Australmelanesian, or African dental patterns(Scott and Turner 1997). ASUDAS was designed to examine a large number of traits in order that a variety of problems, not just affinity assessment, can be studied——epigenetics, field gradients, growth, intra-and inter-trait relationships, inheritance, wear, health, and so forth.

For those readers who were lead to believe that the senior author unreliably assessed the trait expressions that do remain in the casts of the three Upper Cave crania, two additional workers have scored the dentitions using ASUDAS. There are three levels of experience reflected in the accompanying tables of observations. Turner has had the greatest amount or experience with ASUDAS. As one of Turner's former doctoral students, Diane Hawkey has the intermediate level of experience. Yoshitaka Manabe has used ASUDAS the least, both in numbers of years and individuals examined.

Tables 1—5 present our observations on the Upper Cave teeth and jaws. Simple informal scanning of these sets will reveal that there is a great deal of concordance between observers. It has been shown that inter-observer differences of one grade are not uncommon, but when they do occur they are random in direction (Nichol and Turner, 1986). Chi-square comparisons in Tables 1—3 show that the amount of interobserver difference is not statistically significant in our scoring of the Upper Cave dental morphology, despite what might be thought of as considerable difference (Table 6).

Table 1　Upper Cave dental morphology comparisons*

No. 101 "Primitive Mongoloid" (old man)

Observer	Manabe		Hawkey		Turner	
Side	R	L	R	L	R	L
Upper Jaw						
Winging	3	3	–	–	3	3
Double-shovel I1	–	–	–	–	0	0
Double-shovel I2	–	–	–	–	0	0
Interruption groove/t. d. I2	–	–	–	–	–	0
Canine mesial ridge	–	–	–	–	–	–
Canine d. a. r.	–	–	–	–	–	–
Metacone M2	4	4	3. 5	–	–	–
Metacone M3	–	3. 5	1	1	3	3
Hypocone M2	–	–	–	–	0	–
Hypocone M3	–	–	0	0	0	0
Cusp 5 M1	–	–	–	–	–	–
Cusp 5 M3	–	–	0	0	0	0
Carabelli M1	–	–	–	–	–	–
Carabelli M3	–	–	0	0	0	0
Parastyle M1	–	0	–	–	–	–
Parastyle M2	0	0	0	0	–	–
Parastyle M3	0	0	0	0	–	0
Enamel extension P1	0	0	–	–	–	–
Enamel extension P2	0	0	–	–	–	–
Enamel extension M1	0	0	–	–	–	3
Root number M1	–	–	–	–	(3	3)
I2 congenital absence	0	0	0	0	0	0
P2 congenital absence	0	0	0	0	0	0
M3 congenital absence	0	0	0	0	0	0
Supernumerary teeth	0		0		0	
Palatine torus	Medium		Medium		Medium	
Lower Jaw	L	R	L	R	L	R
P2 lingual cusp variation	2	–	–	–	–	–
M2 groove pattern	–	–	Y	–	–	–
M3 groove pattern	–	–	X	–	X	X
M2 cusp number	–	–	4	–	–	–
M3 cusp number	6	–	6	–	6	–
M2 protostylid	–	–	0	0	0	0
M3 protostylid	–	–	0	0	0	0
M2 cusp 5	–	–	0	–	–	–
M3 cusp 5	2	–	–	–	–	–
M2 cusp 6	–	–	0	–	–	–
M3 cusp 6	1	–	2	–	2	–
M2 cusp 7	–	–	0	0	0	0
M3 cusp 7	–	–	0	–	0	0
M1 root number	–	–	–	–	–	2
I1 Congenital absence	0	0	0	0	0	0
P2 Congenital absence	0	0	0	0	0	0
M3 Congenital absence	0	0	0	0	0	0
Supernumerary teeth	0		0		0	
Mandibular torus	Trace		Trace		Trace	
Rocker jaw	Yes		Yes		Yes	

* Numbers generally denote grades of expression where 0 is absent, 1 and greater are degrees of presence. See Turner, Nichol and Scott 1991. – means missing data.

Table 2 Upper Cave dental morphology comparisons* No. 102 "Melanesoid" (female)

Observer	Manabe		Hawkey		Turner**	
Side	R	L	R	L	R	L
Upper Jaw						
Winging	–	–	–	–	Possible	
Metacone M1	5	5	4	3.5	5	5
Metacone M2	3.5	3.5	3	3	4	4
Metacone M3	–	3.5	–	–	–	3.5
Hypocone M1	5	5	4	4	4	4
Hypocone M2	3	2	2	3	3	3
Hypocone M3	–	2	–	–	–	–
Cusp 5 M1	–	–	2	3	+	+
Cusp 5 M2	1	1	–	3	+	+
Cusp 5 M3	–	4	–	–	+	–
Carabelli M1	3	2	0	0	1–2	1–2
Carabelli M2	0	0	0	0	0	0
Parastyle M1	0	0	0	0	0	0
Parastyle M2	0	0	0	0	0	0
Parastyle M3	–	0	–	–	–	–
I1 root number	1	1	1	1	1	1
I2 root number	1	1	1	1	1	1
C root number	1	1	1	1	1	1
P1 root number	1	1	1	1	1	1
P2 root number	1	1	1	1	1	1
I2 congenital absence	0	0	0	0	0	0
P2 congenital absence	0	0	0	0	0	0
M3 congenital absence	U	U	U	U	U	U
Supernumerary teeth	0		0		0	
Palatine torus	Medium		Medium		Trace	

* Numbers generally denote grades of expression where 0 is absent, 1 and greater are degrees of presence. + means present; – means missing data. See Turner, Nichol and Scott 1991.

** Prognathic. Palate shaped like Aleut-Eskimo. Also has shallow sockets that are like those found in Arctic Mongoloids.

Table 3 Upper Cave dental morphology comparisons* No. 103 "Eskimoid" (female)

Observer	Manabe		Hawkey		Turner*	
Side	R	L	R	L	R	L
Upper Jaw						
Winging	–	–	–	–	0	0
Metacone M1	5	5	–	–	–	–
Metacone M2	3.5	–	–	–	4	–
Hypocone M1	5	5	–	–	4	–
Hypocone M2	3	–	–	–	3	–
Carabelli M2	–	–	0	–	–	–
Parastyle M1	–	0	–	0	–	0
Parastyle M2	0	–	0	–	0	–
I1 root number	1	1	1	1	1	1
I2 root number	1	1	1	1	1	1
C root number	1	1	–	1	–	–
P1 root number	1	1	1	–	1	–
P2 root number	1	1	1	1	1	1
M2 root number	–	2	–	2	–	2
M3 root number	1	1	1	1	1	1
I2 congenital absence	0	0	0	0	0	0
P2 congenital absence	0	0	0	0	0	0
M3 congenital absence	0	0	0	0	0	0
Supernumerary teeth	0		0		0	
Palatine torus	Medium		Marked		Medium	

* Numbers generally denote grades of expression where 0 is absent, 1 and greater are degrees of presence. – means missing data. See Turner, Nichol and Scott 1991. ** Turner also noted that the palate is shaped like that of Aleut-Eskimos. No. 103 also has short root sockets like those of Arctic Mongoloids.

Table 4　Upper Cave status/wear comparisons*

Observer	Manabe		Hawkey		Turner	
Side	R	L	R	L	R	L
	101 "Primitive Mongoloid"					
Upper Jaw						
I1	3	3	3	3	3	3
I2	3	3	3	3	3	3
C	3	3	3	3	3	3
P1	3	3	3	3	3	3
P2	3	3	3	3	3	3
M 1	3	3	3	3	4	4
M 2	3	3	2.5	2.5	3	3
M 3	2	3	2	2	2	2
Lower Jaw	L	R	L	R	L	R
I1	4	4	3	3	3	3
I2	4	4	3	3	3	3
C	4	4	3	3	3	3
P1	3	3	3	3	2	2
P2	3	3	2.5	2.5	2	2
M 1	3	3	3	3	3	3
M 2	3	3	2.5	2.5	2	2
M 3	2	2	2	2	2	2
	102 "Melanesoid"					
	Manabe		Hawkey		Turner	
Upper Jaw	R	L	R	L	R	L
I1	P	P	P	P	P	P
I2	P	P	P	P	P	P
C	P	P	P	P	P	P
P1	P	P	P	P	P	P
P2	P	P	P	P	P	P
M 1	1	1	1	0.5	2	2
M 2	0.5	0.5	0.5	0.5	0.5	0.5
M 3	U	U	U	U	U	U
	103 "Eskimoid"					
	Manabe		Hawkey		Turner	
Upper Jaw	R	L	R	L	R	L
I1	P	P	P	P	P	P
I2	P	P	P	P	P	P
C	P	P	P	–	P	P
P1	P	P	P	P	P	P
P2	P	P	P	P	P	P
M 1	3	3	3	3	3	3
M 2	2	P	2.5	P	2.5	–
M 3	P	P	P	P	P	P

* Numbers generally denote grades of wear 0.5 is trace, 1 and greater are more severe. – means missing data. See Turner, Nichol and Scott 1991. P= postmortem loss. U= unerupted.

Table 5 Upper Cave comparisons of oral health/behavior*

Observer	Manabe	Hawkey	Turner
101 "Primitive Mongoloid"			
Upper Jaw			
Abscessing	0	0	0
Periodontal disease	general	–	general
	slight	–	slight
			LRM1, LM3
Chipping	–	–	LM2
Cultural treatment	–	–	0
Lower Jaw			
Abscessing	3	LI1 RM1	LI1 RM1
Periodontal disease	general	–	general
	slight		slight
102 "Melanesoid"			
Upper Jaw			
Abscessing	0	0	0
Periodontal disease	0	0	0
Chipping	0	0	0
Cultural treatment	–	0	–
103 "Eskimoid"			
Upper Jaw			
Abscessing	0	0	0
Periodontal disease	general	–	general
	slight		slight
Chipping	–	LRM1	RM1
Cultural treatment	–	0	–

* See Turner, Nichol and Scott 1991.

Table 6 Interobserver differences in scoring of Upper Cave dental morphology

101 "Primitive Mongoloid"						
Observer pair	Manabe–Hawkey		Manabe–Turner		Hawkey–Turner	
Discordance*	51.3%		48.7%		53.8%	
No. of pairs	19/37		19/39		21/39	
	Manabe–others		Hawkey–others		Turner–others	
Chi-square (1 d.f.)	0.053	P> 0.05	0.463	P> 0.05	0.212	P> 0.05
	Manabe–Hawkey		Manabe–Turner		Hawkey–Turner	
Unscorded pairs	32.4%	16.3%	35.9%	15.4%	18.0%	12.8%
	12/37	6/37	14/39	6/39	7/39	5/39
102 "Melanesoid"						
Observer pair	Manabe–Hawkey		Manabe–Turner		Hawkey–Turner	
Discordance	17.6%		20.0%		17.4%	
No. of pairs	6/24		5/25		4/23	
	Manabe–others		Hawkey–others		Turner–others	
Chi-square (1 d.f.)	0.169	P> 0.05	0.049	P> 0.05	0.412	P> 0.05
	Manabe–Hawkey		Manabe–Turner		Hawkey–Turner	
Unscorded pairs	4.2%	16.7%	8.0%	8.0%	8.7%	0.0%
	1/24	4/24	2/25	2/25	2/23	0/23
103 "Eskimoid"						
Observer pair	Manabe–Hawkey		Manabe–Turner		Hawkey–Turner	
Discordance	26.3%		15.8%		21.1%	
	5/19		3/19		4/19	
	Manabe–others		Hawkey–others		Turner–others	
Chi-square (1 d.f.)	0.633	P> 0.05	0.175	P> 0.05	0.146	P> 0.05
	Manabe–Hawkey		Manabe–Turner		Hawkey–Turner	
Unscorded pairs	5.3%	21.1%	5.3%	10.5%	21.1	10.5%
	1/19	4/19	1/19	2/19	4/19	2/19

* A pair of observations was considered discordant if one or the pair had no score (missing data) or the scores were different by greater than one grade. Values in this table synthesize the raw scores in Tables 1—5.

The major amount of difference between observers comes from when one of a pair decides not to score a trait in question, whereas the other of the pair does score the trait. For example, the first trait at the top of Table 1 shows that Manabe and Turner felt they could score upper central incisor winging as a grade 3 (straight), whereas Hawkey decided she could not make a judgement. For the next trait, double-shovel of the upper central incisor, Turner decided that the condition was absent, whereas Manabe and Hawkey felt they could not score the trait.

As might be expected with experienced researchers who when they do err, do so on the side of conservatism, not scoring a trait that is present represents a conservative decision. Not scoring the expression or occurrence of a trait is reflected in our differing degrees of caution, experience with ASUDAS, and the morphological ambiguity arising from the amount of wear——101 has heavier wear than 102 and 103. This difference in wear probably contributed to the greater amount of discordance found for 101 than for 102 or 103 (Table 6). Least experienced Manabe did not score 19.0% (31/163) of the paired observations. Intermediately experienced Hawkey did not score 17.4% (28/161). Most experienced Turner did not score 10.4% (17/164) of the paired comparisons. Manabe and Hawkey have sacrificed some potential information, but what they did recover is confidently of high quality as assessed by the Chi-square comparisons.

2 Discussion

This communication makes three points: (1) The original dental pattern identification by Turner (1985) of the Upper Cave teeth was based on observations of all three cranial casts. We concur with Weidenreich that the available bioarchaeological evidence on context, taphonomy, and geology supports the view that all three should be studied as a contemporary group if not a family. (2) Dnetal comparisons of three observers show no significant differences. Hence, we disagree with Brown´s statement that these casts cannot be reliably examined. (3) The comparative observations by Manabe and Hawkey support the reliability of the original scores by Turner (1985), who, using C. A. B. Smith´s Mean Measure of Divergence (MMD) multivariate statistic (Berry and Berry, 1967), found that the Upper Cave teeth were effectively identical with the Sinodont pattern and unlike the Upper Paleolithic or recent European dental pattern. The Upper Cave/Paleo-Indian (Sinodonts) MMD= - 0.159; American Indian (Sinodonts), MMD= - 0.080; USSR Upper paleolithic Cro-Magnons and Mal´ta, MMD= 0.205; modern Northwest Europeans MMD = 0.617 (Turner 1985: 37). Informally, the Upper Cave teeth do in fact retain a somewhat Sundadont-like quality, as do Paleo-Indians (Turner, 1985), but this cannot be formally demonstrated in either group due to their small sample sizes. It is concluded that the teeth of the three Upper Cave people fit the Sinodont pattern. If these remains are eventually found to date towards the older end of the range from 11 000 to 30 000 years, then

Sinodonty has likely evolved out of Sundadonty by at least that time.

One final remark is in order. The controversy surrounding the Upper Cave racial identification is underlain by the divergent views on anatomically modern human origins. Some workers envision all modern humans as originating out of Africa. Others feel that modern humans emerged more-or-less independently in Africa, Europe, and Asia. These viewpoints are terms "rapid replacement" or "multiregional," respectively. Some other workers find these opposing positions so extreme, that alternative explanations are being sought. The senior author is one of the latter, calling his model the "shifting continuity" hypothesis (Turner, 1995). This model envisions all modern populations having an origin from a population possessing a proto-Sundadont dental pattern. The geographic homeland of this pattern seems to have been Southeast Asia, including South China, and perhaps southeastern India and Sri Lanka (Turner, 1992a, 1992b, 1995; Hawkey, 1998). If the Upper Cave people lived 30 000 years ago, it would mean that their ancestral dental pattern, Sundadonty, must be to some extent, older. Inasmuch as Liujiang (67 000 BP), Niah (40 000), Minatogawa (22 000 BP), and Tabon (20 000) all seem to possess the Sundadont pattern, as do all known Mesolithic and recent Southeast Asians and the Jomonese, an antiquity estimate for Sinodonty, as represented in Upper Cave, of 30 000 years seems better than 11 000 B. P. A similar inference can be made on the basis of there having been found no microlithic blades in Upper Cave. This technology was widespread in China, Korea, Japan, Mongolia, and Siberia by at least 15 000 years ago (Chen *et al.*, 1989).

In Hanihara's (1994) multivariate studies of the Upper Cave, Minatogawa, Liujiang crania, and many samples of more recent east Asian crania, he found that the Paleolithic specimens usually formed a distinct and remote cluster from the moderns as expected given their probable antiquity. However, they always more strongly resembled Sundadont Southeast Asians, Jomonese, and Ainu, than recent Sinodont Chinese, Japanese, Yayoi, Mongols, Anyang Chinese, and other more northernly Asian groups. Since Liujiang is seemingly the oldest of the three named specimens, the reader might want to know the dental morphological basis for Turner's having identified it as possessing Sundadont qualities. This was done on the basis of upper teeth only, all rather worn, since there is no mandible. Despite a general wear grade of 2 (cusps largely worn off), there does not seem to be any but the lowest possible grade of incisor shoveling (grade 1). There is no indication of double-shoveling on any of the incisors or canines. There is no central incisor winging, and no indication of interruption grooves or tuberculum dentale on the incisors or canines. There is a space of about 2.0 mm between the central incisors. The lateral incisors are not reduced or peg-shaped, however, the third molars seem to be congenitally missing. There is no palatine torus. Taken altogether, and allowing for wear, the Liujiang dental morphology fits better with the simplified and retained Sundadont dental pattern than it does with the more specialized Sinodont pattern (Turner, 1990). The dental differ-

ences between Liujiang and Upper Cave are consistent with Turner's model of Sinodonty evolving in more northerly Asia out of a Sundadont base. The conspicuous differences between Sinodonty and the late Pleistocene and modern dental pattern of Europe (marked simplification) provides powerful information demonstrating the strong relationship between Northeast Asians and Native Americans.

In sum, it is our view that had not Weidenreich given racial labels to the Upper Cave crania, and had there been better bioarchaeological associations for the bones, the cave deposits, the taphonomy, context, and dating considerations, and had not the remains been studied individually because of completeness or incompleteness, Upper Cave would have been easily considered as simply another early robust series in the microevolution of regional populations of antomically modern humans all over the world.

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