

VERTEBRATE PALEONTOLOGY,
ESPECIALLY OF NONHUMAN PRIMATES, IN CHINA

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INTRODUCTION

As will be abundantly clear to all readers of this compilation of reports, there was an extensive overlapping of interests and competence among the delegation members. This tended to bind the delegation together by increasing our professional interactions but made division of labor more difficult. Formally, I was designated the vertebrate paleontologist, but my main interest was in nonhuman fossil primates (in addition to other fossil vertebrates), fossil man, and his Paleolithic cultural remains. Therefore, it seems wisest to divide my report into two major aspects--a brief review of Chinese vertebrate paleontology as I saw it and a more formal section commenting on specific primate fossils seen there or elsewhere. Parts of the former section concerning the IVPP have been grouped with comments of other delegation members in Appendix B, and some of this material has previously appeared elsewhere (Delson, 1976). Additional information on various aspects of Quaternary research in China may be found in the report of the Australian Quaternary Sciences delegation (*Australian Quaternary Newsletter*, April 1976).

NOTES ON VERTEBRATE PALEONTOLOGY IN THE PEOPLE'S REPUBLIC OF CHINA

Institutions Supporting Research on Fossil Vertebrates

Institute of Vertebrate Paleontology and Paleoanthropology, Peking

The main center of vertebrate paleontological research in China is the Institute of Vertebrate Paleontology and Paleoanthropology (IVPP). (It is of minor linguistic interest that after delegation members kept referring to the Institute as the IVPP for several days, I was told by Chou Ming-chen that the Chinese began to do so also, which they had never done previously.) As indicated, most of the delegation's information about the IVPP is presented as a unit in Appendix B, but some additional notes are included here as specifically related to vertebrate paleontology. Several additional centers appear to support active, long-term interest in the subject, including: the Shanghai Natural History Museum; the Tientsin Natural History Museum; the Department of Geology of Northwestern University, Sian; and possibly the Kwangtung

Provincial Museum, Canton. Other centers may exist, but we were not informed of them--they may have a passing interest in vertebrate paleontology, as when a local brigade makes a restricted discovery, not followed by long-term research in a region.

The personnel of the IVPP is assigned by the central manpower authorities, as is the case with all of China's work force. Before the Cultural Revolution, members of the research staff taught formal (undergraduate) courses at Peking University and worked with graduate students. Formal graduate training and Ph.D. exams (and theses) were abolished after the late 1960's, however. It now appears that younger research workers are assigned to the IVPP from one of a small number of colleges offering training in geology and anthropology: Fu-tan, Peking, Nanking, and Northwestern Universities are the main sources. There may be some negotiating by IVPP leaders with the state authorities in order to acquire promising candidates (perhaps recommended by their universities).

New permanent personnel of the IVPP are trained in all aspects of technical and research procedures, assisting senior colleagues until they are assigned projects of their own, individually or, more commonly now, in teams. Among technical services, I can indicate as an amateur mold and cast maker that work in this area is of the highest quality. Many molds appear to be made in plaster, from which both plaster and plastic casts can be pulled, although the latter lead to rapid mold deterioration. I demonstrated the use of both polysulfide and silicone rubber molding compounds and left some for experimentation by IVPP personnel, but these materials may prove too expensive for standard use. The IVPP prepares casts both for Chinese museum exhibits and research purposes and for foreign colleagues, based on international equality as well as political contact between the nations involved.

Most of our time at the IVPP (5 full days in my case) was spent at a newly occupied building in two large rooms; we did not see any offices or other facilities in the building. In one room we were formally received, heard some introductory presentations by our hosts, and several of us presented lectures about aspects of our own research, illustrated with slides and semisimultaneously translated by either Wu Hsin-chih or Chou Ming-chen. In the second, smaller room we heard reports by staff members about specific paleoanthropological localities and remains and were able to examine and photograph specimens. Two large safes in this room housed fossil human and *Gigantopithecus* remains, while casts and some vertebrate fossils from paleoanthropological localities were stored in cases along two other walls.

The IVPP and People's Republic of China in general have good reason to be proud of not only the important recent finds in vertebrate paleontology but also the close and excellent relations between IVPP investigators and local informants and inhabitants. Because of the impressive program of museum exhibits on evolution and paleontology and a network of local and regional antiquities commissions, the majority of major finds are due to the transmission of information and fossils discovered by farmers and other workers to the IVPP, which may then send a field team to work together with regional institutions and local people in the recovery of larger collections. Some of the important recent work, especially that relating to paleoanthropology, will be discussed below.

Institutions Outside Peking

In addition to the IVPP, at least four other institutions are engaged in vertebrate paleontology research. The Natural History Museum in Tientsin was visited by almost the entire delegation. The one vertebrate paleontologist there, Huang Wei-yung, was a fish specialist at the IVPP before being assigned to Tientsin. Most of his work now deals with mammals, which form the bulk of the collection. About 25 percent of the 300,000 specimens in the museum are fossil vertebrates, of which some two-thirds are from the Huangho-Paiho Museum of prewar days; among the new material are fossil fish from Ni-ho-wan. A small building houses these collections, mostly from four main regions: Ni-ho-wan, Sjara-osso-gol (Ordos), Ch'ing-yang, and Yü-she. Although Teilhard had reported an important specimen of *Procynocephalus* (associated mandible and partial skull) in the Tientsin museum, it could not be located, nor was the museum staff aware of it. It appears to have suffered the same fate as those in Peking (see p. 51). This collection does not appear to be the subject of active study, but it is a major source of fossil documentation.

More concerted research efforts are under way at the (newly reorganized) Shanghai Natural History Museum. This museum was begun in 1956 in the old Mercantile Exchange. Of a total staff of over 200, more than 100 are scientific workers. Current exhibits deal with modern animals, paleontology, and human evolution: "from ape to man." It is planned to add botany, geology, ethnography, and human biology as well as adding to the invertebrate halls (only insects are included now) while moving some exhibits to a second building. Over 1.6 million visitors have come through since 1972, about 2,000/day, of whom 60 percent are students and children. Three paleontologists deal with all phases of the field, both research and exhibition (Ts'ao K'o-ch'ing, Hsieh Wan-ming, and Wang Hsiang-wen). At least two main projects appear to be under way, both in cooperation with the IVPP: the early Cenozoic of the Nan-hsiung Basin in Kwangtung and the "late" Pliocene of the Ling-t'ai area, in Kansu near the Shansi border. Specimens from Ling-t'ai include rodents, artiodactyls, and proboscideans.

After discussion of preparation methods, we were shown several specimens from Kwangtung being cleaned in a small room lit mostly by one window (this may have been merely a room chosen to let us see an example, not the actual lab). Material included a late Cretaceous chelonian and a Paleocene anagalidan mandible, and the technique was indicated to be mostly manual grain removal with needles and small hammers, although the scientists were acquainted with both acid and airbrasive techniques. One large hall was devoted to paleontological exhibitions, with displays dealing with the origin of life and the history of the vertebrates and especially the mammals found in China. Many casts were exhibited, including several large dinosaur mounts. One of the two mammalogists who were also on the staff of the museum noted that collecting teams study ecology and behavior of the animals they seek. Mention was also made of about 10 nature preserves controlled by the Ministry of Agriculture and Forestry. These include one in Szechwan for pandas (and neighbors) and one in the northeast especially for Siberian tigers.

At Northwestern University in Sian, Hsüeh Hsiang-hsi is a verte-

brate paleontologist trained in Peking. Her teaching duties include field collection trips with students, and she also has some time devoted to research. Two rooms contained paleontological specimens. One was mainly for students' study purposes, with fossils exhibited inside glass-topped cases that were not normally opened. A wide range of fossil materials and some casts were on display here, including both vertebrates and invertebrates. In a second room were exhibited specimens collected by the University teams. Among the localities represented were: Ho-huan, a late Pleistocene site in Kansu, with some paleolithic artifacts, rhinoceros, megaceros, and "*Cervus cf. canadensis*"; and Wu-tu, a Kansu site listed as "early Pliocene." The fauna from this site included a schizotherian chalicothere, *Megantereon*, *Eomellivora* (according to labels), and *Macaca* (see nonhuman primates below). Hsüeh also indicated that in the first year of undergraduate geology training a student takes courses in mathematics, physics, chemistry, and general geology; historical geology, petrology tectonics, and paleontology are taken in the second year (especially by paleontology students?); and mineralogy and "new methods" are studied in the third year. In addition, foreign language is taken in all three years. Unfortunately, this discussion was not completed.

Several small collections of Pleistocene fossil mammals were displayed and later shown to us at the Kwangtung Provincial Museum in Canton. These were mostly collected in association with the search for archeological materials, but it does indicate that such small collections may be found in other local museums.

Some Specific Notes on Recent Research

Many studies, both in the field and in the lab, have been undertaken by IVPP personnel in the past decade. Most of these are published after completion in *Vertebrata Palasiatica*, and there is no necessity to comment on them here. However, three segments of paleontological research discussed during our trip are relevant to this report. I will first summarize recent work on Paleocene and some Pleistocene mammals and stratigraphy, and comments on Eocene to Pleistocene local faunas yielding primates will be included in the following section.

Early Tertiary Localities

In terms of mammals, the most exciting work in recent years has been the study of an ever-increasing number of Paleocene sites in various Chinese provinces. Few of these fossils have been studied in any detail as yet, but eventually perhaps 50 new taxa may be described. The dominant element of the assemblages appears to be the order Anagalida, but Edentata, Condylarthra, Tillodontia, and Pantodonta are also represented. Unfortunately, no primates have yet been identified, despite the reports of "middle Paleocene lemuroids" by Chao (1973) and Lisowski (1974). I assume that these writers were told of the presence of anagalidans but

did not realize that this group has long been removed from the primates. During the course of our visit, Chou kindly summarized these finds stratigraphically for me; in the months after we left, he undertook further field studies on the Paleocene of Inner Mongolia. Among the regions that have yielded Paleocene mammals are: the Nan-hsiung Basin of north Kwangtung, with middle and perhaps early Paleocene (see Chou *et al.*, 1973); the Ch'a-ling Basin of southeast Hunan, with middle and perhaps later Paleocene ("Kao Hung-hsiang," 1975); the Ta-yu area of southwest Kiangsi with middle or later Paleocene (and early Eocene at Hsin-yü, near the center of the Province); and the Ch'i-shan and Hsüan-ch'eng regions of southeastern Anhwei producing middle Paleocene to early Eocene (Chou and Feng, 1973). In addition, early Eocene has been found in Shantung, while later Eocene and Oligocene mammals have been found in the T'ien-tung and Pai-se areas of western Kwangsi (Tang *et al.*, 1974b) and the Hua-ning area of central Yunnan. In the Junggaar Basin of Northern Sinkiang, deposits range in age from Permian through Pleistocene (although Paleocene has not yet been identified).

Pleistocene Localities

In the course of lectures and discussions at the IVPP, we received summaries of current interpretations of several Pleistocene paleoanthropological sites or "fields" which might usefully be repeated here, although most are already published. Some additional information reported by the Australian delegation is included also. Notes on the human fossils and artifacts from these localities are presented in other chapters and will not be repeated here. Tedford and colleagues at the American Museum of Natural History are now preparing annotated faunal lists of the numerous Chinese localities represented in the Museum's collections made during the Central Asiatic Expeditions of the 1920's, which will be a most useful reference in this field.

In northern China, the Chou-k'ou-tien fissures and caves range in age between Pliocene (possibly Late Miocene) and latest Pleistocene. Hope (1976) reported a date of 18,400 B.P. for the Upper Cave, just recently published (Laboratory of IA and IVPP, 1976). No new work appears to have been done on the older localities, but work at Locality 1 has continued, especially in 1959 and 1966, and the New Cave (continuous with Locality 4) has been almost entirely excavated. We were informed that perhaps two-thirds of Locality 1 remains to be excavated. Some studies have been undertaken of the stratigraphic differences in fauna within the cave levels (Kahlke and Chow, 1961), but more such work, along with further interdisciplinary investigations, might be profitable in the future. Chinese workers now consider the age of Chou-k'ou-tien Locality 1 as probably interglacial, perhaps equivalent to the Holstein or "Mindel/Riss" of Europe, a view generally shared by Western authors. The topic of Chinese Pleistocene glaciation was not formally discussed with our group, but the data shown in Table 1 were presented by Jennings (1976, p. 17) as a summary and amplification by Hsüan T'ien-ch'in of work published by Li Yung-chang *et al.* (1972).

TABLE 1 Chinese Glacial Stratigraphy

Stage	Type Area	Tentative Correlation with the Alps
Ta-li Glacial	Ta-li Lake (Yunnan)	Wurm
Lan-t'ien Igl.	Lan-t'ien (Shensi)	
Lu-shan Glacial	Lu-shan (Kiangsi)	Riss
Chou-k'ou-tien Igl.	Chou-k'ou-tien Locality 1 (Hupei)	
Ta-ku Glacial	(None given by Jennings)	Mindel
Yüan-mou Igl.	Yüan-mou Lake beds (Yunnan)	
Po-yang Glacial	Po-yang Lake boreholes (Kiangsi)	Gunz

Jennings (1976, p. 21) further commented on the origin of Locality 1 that:

A 'cap travertine' with bat bones in it is the evidence for the inference that it is the fill of a cave and not of an open cavity in the limestone. Much cave breakdown is included in the fill as is to be expected of the ruin of a cave but there was also much bedded gravel and sandy clay which were waterlaid. It is easier to understand the emplacement of these beds if they accumulated when the plain stood at a considerably higher level than now.... The New Cave is at much the same level as the main *Homo erectus* excavation. The front of this cave was almost blocked by angular rock debris from cave entrance collapse or from the slope above it. The sediments on the floor of the cave include flowstone and some fine sediment, neither of which imply river flow in the cave. They could have formed with the plain outside at a much lower level than that of the New Cave.

The longest continuous sequence of later Cenozoic rocks in the north is at Ni-ho-wan, some 200 km west of Peking. We requested but were denied permission to visit this region, although the Australian delegation did so later (see Section of Ni-ho-wan Cenozoic, 1974; Hope, 1976; Jennings, 1976). In a lecture during our visit to the IVPP, we were informed that at least 600-700 m of silts and clays with some sands and gravels occur in the basin, dipping toward the center. The section probably ranges in age from late Pliocene to late Pleistocene with gaps and would be a most profitable region for paleomagnetic sampling and general interdisciplinary study. As yet, no hominid or other primate fossils are known from Ni-ho-wan, but some tools of early Paleolithic typology have been reported, and large collections of mammals exist in China and elsewhere.

The Lan-t'ien area, near Sian, was a second region that we had hoped to see at first hand but that proved inaccessible. Like the Sanmen Gorge region, it is important in linking North and South Chinese Plio-Pleistocene deposits. Lan-t'ien is most famous for its mid-Pleistocene hominid fossils and associated fauna and artifacts, but recently both early and late Pleistocene faunal assemblages have also been reported

(Chi, 1975 and 1974, respectively), and, of course, the region was first investigated by the IVPP after discovery of the underlying early Tertiary beds in 1963. A major interdisciplinary report on Lan-t'ien (IVPP, 1966) was published at the start of the Cultural Revolution and is almost unknown in the United States. As indicated by Howells in the next chapter, two sublocalities yielded the human faunal remains--Kung-wang-ling and Ch'en-chia-wo. The former local fauna is larger, with 38 mammal species vs. 14 at Ch'en-chia-wo (of which 11 occur at both sites). The two were considered by Wu Hsin-chih in his presentation to be equivalent in age, although this may in part depend on altitudinal and lithologic similarities.

The Lan-t'ien area, like the Ting-ts'un region we visited, is in the loess area of central China. Although this subject also was not discussed with our delegation and best belongs elsewhere in this volume, it may be useful to summarize work reported to the Australian delegation during their visit (Jennings, 1976), as it relates to Pleistocene stratigraphy. At one Shansi locality where the loess thickness reached 134 m, paleomagnetic studies were undertaken, and the units were subdivided as shown in Table 2. If these deposits could be correlated with the fossiliferous sequences of Lan-t'ien and elsewhere, it would be a major step in calibrating the Chinese Pleistocene. Jennings further indicated that the Ma-lan loess may overlie fluvial gravels of the Sjara-osso-gol Formation, dated by its mammalian fossils to the late Pleistocene; he also discussed the question of loess origin.

Finally, there are many karst and other isolated deposits in South

TABLE 2 Litho-, Magneto-, and Chronostratigraphy of a Shansi Loess Section

Subepoch	Loess Formation	Depth, m	Paleomagnetic		Age, m.y.
			Epoch	Polarity	
		0			
Late Pleistocene	Ma-lan	15	Brunhes	N	
Middle Pleistocene	Upper Li-shih	40			
		65			0.69
	Lower Li-shih	74			
Early Pleistocene		100	Matuyama	R	0.89
			(Jaramillo)	N	
	Wu-ch'eng	110			0.95
			Matuyama	R	
		(Base of section)			134

China, some of which are mentioned in the section on fossil primates below, as well as a single, relatively well-studied, long sequence at Yüan-mou, Yunnan Province. This area was originally located and prospected by Walter Granger of the American Museum of Natural History in the winter of 1926-1927. He spent "the better part of one day in the vicinity of Ma Kai, northern Yunnan, where in a valley there was found a rather extensive deposit containing Pleistocene fossils," which were briefly described by Colbert (1940, p. 1). The current status of work here was reported to us at the IVPP by Chou Kuo-hsing. In recent years, the area has become more widely known as a result of the discovery in 1965 of two incisors referred to *Homo erectus* (see Howells) by Ch'ien Fang, of the Academy of Geological Sciences, Ministry of Geology (Hu, 1973). It is interesting that these are apparently the only human fossils of significant antiquity that are stored at the institute that discovered them instead of the IVPP. In 1967-68, during the Cultural Revolution, field teams of the IVPP made large collections of mammalian and other fossils (mollusks, pollen, and spores), but no further hominid remains were reported.

The Yüan-mou sequence is located in an oval basin about 1,100 m in elevation, some 30 km long north-south and 7 km wide east-west. The west flank, 1,400 m high, is older rocks, the 2,700-m east flank being Jurassic red beds. Four formations were recognized in the basin, as indicated in Table 3. The age of the Yüan-mou Formation is variously considered as early Pleistocene or early middle Pleistocene; perhaps it spans the local boundary, with the human teeth from the younger, upper part. Mammalian fossils from this region have been discussed recently by You and Qi (1973), Liu *et al.* (1973), Tang *et al.* (1974a), and Liu and You (1974). Professor K. C. Chang has informed me that a recent newspaper article reported that paleomagnetic studies undertaken in the Yüan-mou region resulted in dating between 1 and 2 million years (Matuyama reversed epoch) and an approximate date of 1.4 million years for the Yüan-mou Formation (perhaps the upper part with the hominid fossils).

A REVIEW OF NONHUMAN FOSSIL PRIMATES FROM CHINA

In keeping with the broad interpretation of paleoanthropology underlying our visit, some study was attempted of the earliest known representatives of primates in China, as well as examination of younger forms more closely related to, or occurring in association with, early man. Fossils representing 15 genera have been claimed to occur in China, but of these one genus (perhaps a second and third) is not a primate, while two others are synonyms. Each will be discussed in turn, following a "strato-taxonomic" sequence.

Fossil specimens were made available for our examination at the IVPP and also at the Chou-k'ou-tien research station. During our visit to the old IVPP building, we were invited to indicate our interest in observing any of the many specimens on exhibit in the museum area. Here were stored the type and figured specimens of the early Tertiary primates, as well as a few pieces from Chou-k'ou-tien. At the Chou-k'ou-tien institute we were also asked if we wished to see any specific

TABLE 3 Yüan-mou District, Yunnan, Summarized Section

Formation Name	Age	Thickness, m	Contents, comments, lithology
	"Holocene"		Neolithic
Wa-cha-ch'ing	Late Pleistocene	10	Terrace deposits, overlaps others
	(erosional interval)		
Lao-hung-kou	Middle Pleistocene	25	
	(erosional interval)		
Yüan-mou	Early or early middle Pleistocene	126	Hominid incisors in upper clay layer; most fossils in upper 70 m of fine sands and yellow clays
			Lower 50 m coarser sands and red clays
			Basal 8 m gravels, variegated clays (compared to Pinjor and Lower Irrawady)
	(tectonic activity)		
Sha-kou	Late Pliocene	30	
Pre-Cambrian basement complex			

specimens, and those available were brought out for examination. Unfortunately, it was not possible to see the collection storage facilities, a kind of "locality" where many important discoveries may be made, simply by rummaging in drawers and locating possibly misidentified or misplaced older specimens.

Early and Middle Tertiary Primates

Since Liberation, early Tertiary primate fossils have been found at three localities, including one which had been productive earlier in the century. According to conversations with Chou Ming-chen, both

during our joint examination of the fossils and in the course of our stay in the Peking area, some revision of previous age estimates has been made for the three localities involved. These are based on re-interpretation of the faunal assemblages, as conveyed to me by Chou Ming-chen.

The geologically oldest primate fossil is a maxilla fragment with the right P^4-M^3 , IVPP No. V2466, which Chou (1961) named *Lushius qinlinensis*. The specimen was recovered from the locality of Men-chia-p'u, in the Lu-shih district of Honan Province (Lu-shih Fm.), the age of which now appears closely correlative with that of Irдин Manha in Inner Mongolia, i.e., early late Eocene. As described by Chou, the P^4 is not yet fully erupted, while the M^3 enamel has been broken or eroded off. The two molars are quite simple in construction, with three main cusps, moderately developed conules, steep buccal faces, and no clear hypocone or pericone. There is no consensus as to the affinities of this primate: Chou (1961) and Gingerich (1976) considered it a tarsii-form, while Szalay (1974), the major modern student of fossil tarsii-forms classified *Lushius* in Adapidae.

Hoanghoniuss stehlini was first reported by Zdansky (1930) from the Yüan-ch'ü Formation of the middle Huang-ho Valley, of supposedly late Eocene or early Oligocene age. The type mandible and an isolated upper molar (now in Uppsala, Sweden) were found in the same horizon as the supposed primate *Adapidium hoanghoense*, now identified as a tillo-dont (Gazin, 1953). In 1953 Chou collected additional specimens that were referred to *Hoanghoniuss* by Woo and Chou (1957). These fossils were recovered from a locality on the north bank of the Huang Ho River in Yuanchu district, southern Shansi Province, which is slightly younger than the type locality (Jen-ts'un, south bank of the Huang Ho River, Mien-ch'ih district, Honan Province). The two localities are of similar age, broadly correlative with the site of Shara Murun (Inner Mongolia), which is later late Eocene. Of the new material, one specimen is a maxilla fragment with the right P^4-M^1 , two are partial mandibles, and the last is an isolated lower molar. Previous examination of the illustrations in Woo and Chou (1957) had suggested to me, and to Malcolm McKenna, that the lower teeth referred to *Hoanghoniuss* were not primate, but probably artiodactyl. My suggestion of this to Chou, while we were studying the specimens together, was well received. We compared the two mandibles to other artiodactyl jaws from this region, but could not find any which seemed to represent the same taxon. On the other hand, the maxilla certainly appears to be primate; the M^1 , with clear pericone and hypocone, as well as three main cusps and two conules, is similar to adapids such as the European late Eocene *Periconodon*. Gingerich (1976) has recently voiced the same opinion, after study of the type specimen, and Szalay (1974) concurred in a probable allocation to the Adapidae.

The third of the recently collected early Tertiary Chinese fossil primates is the most questionable. Chou (1964) described a partial maxilla with right P^2-M^3 (IVPP No. V2933) as *Lantianius xiehuensis*, a possible adapid. The specimen was collected from the early Tertiary horizons underlying the *Homo erectus* locality near Ch'en-chia-wo, in the Kung-kou-wan ravine locality, Hsieh-hu commune, Lan-t'ien district,

Shensi Province. The age was uncertain; it was suggested to be late Eocene, but recent work has revised this to early Oligocene. The morphology of the anterior premolars had suggested to me, McKenna, and Szalay that this specimen might be artiodactyl, but in discussion Chou and I could not be certain either way. More recently, Gingerich (1976) has written a convincing interpretation of *Lantianius*, based on Chou's figures and descriptions, in which he argues it to be a dichobunid artiodactyl because of premolar morphology and large infraorbital foramen. There thus remain only three or four Eocene primate specimens from China: *Lushius*, represented by a single maxilla, either an adapid or a tarsiiiform; and *Hoanghoni*, represented by the type mandible, a new maxilla and perhaps the originally referred upper molar, a latest Eocene adapid. It is greatly hoped that the newly reported Eo-Oligocene deposits from the Pai-se and Yung-lo basins in Kwangsi Chuang Autonomous Region (Tang *et al.*, 1974b) will yield some primates, especially as they are similar in faunal content to the Pondaung Formation of Burma, which includes the lemuriform *Amphipithecus* and the possible haplorhine *Pondaungia*.

Turning to the middle Tertiary, no undoubted primate occurs in the Oligocene or early to middle Miocene, but two specimens that might belong to the order have been reported from the region of Taben-Buluk in western Kansu (Bohlin, 1946). An edentulous and damaged mandibular symphysis and a fragment, possibly of the distal quarter of a lower molar crown, were described by Bohlin and identified as "Kansupithecus," a specific name being omitted "to emphasize that the name at present must be regarded merely as a term comparable with the local names given to geological formations" (p. 238). This specimen has been returned to the IVPP from Uppsala, but unfortunately it could not be located for my examination in Peking. A cast and Bohlin's figures suggest the possibility of catarrhine relationships in the *Pliopithecus*-sized animal, but, although the canine caliber seems large, there is no sign of the long mesiobuccal "flange" on P₃ for honing C' usually seen in catarrhines. Conroy and Bown (1976) have recently commented on various earlier Tertiary Asian primates, concentrating on the age, rather than the morphology, of "Kansupithecus." Their conclusion was that the association of a small mastodont, as well as possibly a lagomerycid deer and a rhinocerotid cf. *Aceratherium*, with "Kansupithecus" combines to suggest an age of later middle Miocene for this collection, much younger than Bohlin's suggestion of late Oligocene. No more recent Chinese work on these deposits was reported to us, although several parties have collected important specimens in various areas of Kansu.

Old World Monkeys

Procynocephalus

The cercopithecoid monkeys are represented by specimens of three genera in the late Pliocene and Pleistocene deposits of China, and it was in hope of studying several reported collections of this group that I first applied to join the delegation. The correlation of Chinese

Plio-Pleistocene fossil assemblages, both within China and beyond, is currently in flux, as much new data have been assembled but not fully interpreted as yet. This is especially true for the older collections, if they have not been resampled or if the fossils were bought rather than obtained *in situ*. The latter appears to have been the case for the first new genus of fossil primate found in China, *Procynocephalus wimani* Schlosser, 1924. The type of this taxon is a female mandible and possibly associated fragments of maxilla from Hsin-an County, Honan Province (Locality 54). The teeth of this specimen(s), studied in Uppsala, are clearly of macaque or baboon type, indicating a representative of the Papionini, but the muzzle and remainder of the skull, so important in generic identification, are lacking. This locality was originally thought to be part of the "*Hipparion*-fauna," that is, late Miocene of modern interpretations, but it is more probably late Pliocene. Of probably similar age is the maxilla fragment from Ku-ti-ts'un, near Ch'ing-shih-ling, Ch'ing-hsing County, Hopei Province, reported by Young and P'ei (1933).

More important, however, are the fragmentary teeth and partial postcranial material described by Teilhard (1938) from Chou-k'ou-tien Locality 12, again of late Pliocene or early Pleistocene age. The similarity of the damaged teeth to those from the two mentioned sites, as well as the low probability of occurrence of two such similarly sized primates in one region, supports Teilhard's identification of the bones as *P. wimani*. The collection includes complete or partial humerus, ulna, radius, tibia, and various wrist and ankle bones, but no phalanges. Jolly (1967) recognized that Teilhard's two "forms" more probably represented the two sexes of a dimorphic species and further emphasized the strongly terrestrial adaptations of the foot and elbow. Teilhard (1938) further noted the presence of a nearly complete mandible and associated maxilla from Yü-she, southeast Shansi, giving measurements, but this specimen has never been published. Despite attempts by Chou Ming-chen and other members of the IVPP, none of these specimens could be located during our stay in Peking. It is possible that, with the advent of the war, their inherently more "valuable" nature as primates caused the fossils to be given special treatment, resulting in their eventual loss or misplacement. Similarly, we inquired about the Yü-she specimen in Tientsin, where Teilhard indicated it was stored ("Hoangho-Paiho Museum"), but it was not located.

No specimens of *Procynocephalus* have been recovered in China since Liberation, and thus the shape of the skull is still unknown. Jolly (1967), however, assigned to this genus the female partial maxilla, probably from the Pinjor-equivalent levels of the Indian Siwaliks, as *P. subhimalayanus* (von Meyer, 1849), and, more recently, Verma (1969) has described a female mandible from Pinjor as *P. pinjorii*. Verma did not attempt comparison with the older specimen, but there seems little doubt that they represent a single species, although they do not occlude perfectly (being from different individuals). Jolly (1967) and Simons (1970) also suggested that *Procynocephalus* might prove congeneric with *Paradolichopithecus* from the European early Pleistocene. This question is now under study, but a decision is difficult at present because of the lack of relatively complete cranial material from Asia

for comparison with the excellent specimens from Europe (see Delson and Nicolaescu-Plopsor, 1975). Both taxa certainly include large terrestrial animals probably descended from macaques, rather than *Papio*-like baboons, but they may represent such a development in parallel. The report by Trofimov and Reshetov (1975) of a nearly complete skull of a similar form in central Asia may be an important link between the two named genera.

Macaca

Several forms of macaque have also been reported from the Chinese Pleistocene. Young and Liu (1950) even named the new taxon *Szechuanopithecus yangtzensis* from the Ko-lo-shan area near Chungking, Szechwan; Koenigswald (1954), however, correctly showed that this genus was based on a wrongly identified dp_4 of a macaque. The first macaque specimen to be reported from China was a male facial fragment described by Schlosser (1924) in the same paper in which he named *P. wimani*. This face was collected (bought?) by Andersson in Mien-ch'ih County, Honan, which may indicate a slightly different age; V. J. Maglio (personal communication, 1971) suggested it to be later early Pleistocene. The specimen is clearly of a macaque, and Schlosser named it *M. anderssoni*, citing only minor differences from other fossil and living species.

A few years later, Zdansky (1928) described fossils from Chou-k'ou-tien, including two human teeth and one lower molar of a cercopithecoid. Young (1934) reported a large number of mostly dental specimens of macaque from Chou-k'ou-tien Locality 1, to which he gave the name *Macaca robusta* (*Macacus robustus* in the original). This sample included several mandibles and maxillae, isolated teeth, and a partial humerus (discussed but not figured) but no more complete cranial material. Some years later, P'ei (1936) noted the presence of a nearly complete skull from Locality 1, which to him indicated close relationship with *M. anderssoni*, but this specimen was never described.

Additional specimens of macaque, mostly fragmentary, have been reported from: Chou-k'ou-tien, Locality 2 (Young, 1932); Ch'ing-shih-ling, Ch'ing-hsing County, Hupei Province (Young and P'ei, 1933; age probably later middle Pleistocene); drugstore specimens thought to be from late or later middle Pleistocene caves in Kwangsi (P'ei, 1935); Chou-k'ou-tien, Locality 3 (P'ei, 1936); Hei-ching-lung-ts'un rock shelter, Ch'iu-pei, Yunnan Province (Bien and Chia, 1938; age probably later middle Pleistocene); Tan-yang cave, Kiangsu Province (P'ei, 1940; age later middle Pleistocene); Chou-k'ou-tien Locality 13 (Teilhard and P'ei, 1941; age similar to basal layers of Locality 1); Ho-shang-p'o, near Chungking, Szechwan Province (Young and Mi, 1941; age ?later middle Pleistocene); Ko-lo-shan, near Chungking, Szechwan Province (Young and Liu, 1950 [including "*Szechuanopithecus*"]; age later middle Pleistocene); Liu-ch'eng, "*Gigantopithecus-caves*," Kwangsi Chuang Autonomous Region (P'ei, 1963, and personal communications from IVPP personnel; age ?later early Pleistocene); all levels of Chou-k'ou-tien Locality 1 except 10 and 11 (near the base--the fauna of levels 12-13 is unpublished; Kahlke and Chou, 1961; three caves (Localities 6146, 6148, 6151) in northeast

Kwangsi (Wu *et al.*, 1962; age ?later middle Pleistocene); Shu-an cave, N. Kwangtung (Liu, 1962; age ?later middle Pleistocene); Hsien-jen cave, near Wan-nien, Kiangsi (Huang and Chi, 1963; "Holocene"); Kung-wang-ling, Lan-t'ien district, Shensi Province (Chou *et al.*, 1965; age ?early-middle middle Pleistocene); Wu-ming, Kwangsi Chuang Autonomous Region (Chang *et al.*, 1973; age ?mid-middle Pleistocene); Pa-ma district, Kwangsi Chuang Autonomous Region (Chang *et al.*, 1975; age ?mid-middle Pleistocene); and Ch'ai-yen-shan in Yung-an, Fukien Province (Young *et al.*, 1975; age probably later middle Pleistocene). The macaque tentatively identified at Ho-shang-tung cave, Yunnan Province (Young, 1932; Bien and Chia, 1938) is probably better identified as a *Rhinopithecus* (see below).

During our stay in Peking, I requested permission to examine any of the above material that was available (the Yung-an find had not yet been published). Unfortunately, much of the older collections, especially from Chou-k'ou-tien, appears to have suffered the same fate as did *Procynocephalus*. Despite searches by the IVPP personnel, I was shown only one mandible (C1822) and one maxilla (C1817) from Chou-k'ou-tien Locality 1 and the male partial maxilla reported from Kung-wang-ling (uncatalogued, Locality V67306). While at the Chou-k'ou-tien site, I was permitted to examine a mandible from Locality 1 (51:8:H1, collected in 1951) and a mandible and somewhat damaged skull, perhaps of a single individual, from Locality 13 (55.5.10, collected in 1955). On the other hand, in the collections of the Department of Vertebrate Paleontology of the American Museum of Natural History, I have located casts of a subadult slightly crushed female mandible (36:62 C-2) and what must be the skull mentioned by P'ei (1936), damaged somewhat but essentially undeformed (34:13:1).

Having examined briefly the specimens now available in China, I am at present studying these casts and will compare them with the type facial fragment of *M. anderssoni* (studied in Uppsala) and with the skull from Tung-Lang, northern Vietnam, which Jouffroy named *Macaca speciosa subfossilis*. Preliminary examination suggests similarities with the living *M. thibetana* and/or *M. arctoides* (ex-*M. speciosa*). In his original paper, Young (1934) did not formally designate a type specimen of *Macaca robusta*, but the female maxilla C1817 was well figured, has the first (lowest) catalog number in the syntype series, and is among the few extant specimens from this series. I therefore suggest designating that specimen as the lectotype in a more formally systematic publication. Today, macaques range in China as far north as the Yangtze, with small enclaves just north of the Yangtze in Szechwan and in northern Hupei, southwest of Peking (P'ei, 1963; Hill, 1974). The known fossils suggest continuity over this range and perhaps habitation further north along the coast (Tan-yang, near Nanking), but the probability of a different species-group.

It is also of some interest to mention a specimen seen in the collections of the Department of Geology, Northwestern University, Sian, Shansi Province. While looking at fossils on exhibit from a number of sites, we noticed a partial mandible of a primate which Hsüeh Hsiang-hsi was kind enough to permit me to examine briefly. The jaw was eroded and the teeth were quite worn; the jaw was broken distal to the right P₄

and the left M_3 ; and the left C_1-P_4 and M_{2-3} were at least partly present. The specimen was certainly of a cercopithecine monkey, best tentatively identified as cf. *Macaca* sp. (neither very large nor very small for the genus). The specimen was in a case with (and stated to be associated with) specimens identified as *Megantereon*, *Eomellivora*, and a schizotherine chalicothere, with an age of "early Pliocene" (late Miocene) given for the locality (Wu-tu, in Kansu Province). If the jaw is indeed that old, it is the oldest known monkey anywhere in Asia, perhaps anywhere outside Africa. Otherwise, the oldest known cercopithecoid in Asia is *?Presbytis sivalensis* (*Cercopithecus* or *Presbytis asnoti* and *Macaca sivalensis*) from the Dhok Pathan of Hasnot, Pakistan. The oldest Asian cercopithecine on present evidence is *?Macaca (ex-Semnopithecus) palaeindica*, apparently from the Tatrot Formation, India. It is interesting that the Wu-tu jaw was the only fossil primate we saw outside the IVPP, except for several teeth of *Gigantopithecus* (at least one possibly in fact an orang) in the Department of Anatomy of Fu-tan University on teaching exhibition. I understand that Hsüeh plans to describe this fossil and others in due course.

Rhinopithecus

A third monkey is also present in some Chinese Pleistocene fossil faunas, but rarely. This is the colobine *Pygathrix (Rhinopithecus)* sp. (see Groves, 1970, on subgeneric rank). Matthew and Granger (1923) first named *Rhinopithecus tingianus* from the (earlier) middle Pleistocene fissure of Yen-ching-kou (I), Wan Hsein (county), Szechwan Province, on the basis of a partial juvenile skull and several jaw fragments (American Museum of Natural History, New York). Colbert and Hooijer (1953) later suggested this form to be a subspecies of *R. roxellanae*, while Groves (1970) has considered it as *P. (R.) brelichi tingianus*, referring it to the living species closest in geographic distribution. *P. (Rhinopithecus)* sp. has also been reported from the Liu-ch'eng "*Gigantopithecus*-cave" and perhaps other Kwangsi caves (P'ei, 1963) and from T'ung-tzu in Kweichow Province (Wu *et al.*, 1975; age ?later middle Pleistocene), while the specimen figured as *Macaca* sp. from Ho-shang-tung cave, Yunnan Province by Young (1932; also noted in list by Bien and Chia, 1938; ?mid-middle Pleistocene) is most probably *P. (Rhinopithecus)* on size and morphology. According to P'ei (1963; see also Groves, 1970), the distribution of *P. (Rhinopithecus)* today includes that known from the sparse fossil record, limited to southern China.

Fossil Hominoidea

Gibbon and Orangutan

A number of hominoid (but nonhuman) primates are also present in Chinese fossil faunas, including two living and four extinct genera. Of the former, *Hylobates* is the rarer. Matthew and Granger (1923) reported a partial mandible from Yen-ching-kou (I), Szechwan, which they named

Bunopithecus sericus. Groves (1972) has suggested it to be a subspecies of *H. (H.) hoolock*, but it is best considered as merely *Hylobates* sp. until more material permits specific (and subgeneric) identification (see also Colbert and Hooijer, 1953). More recently, Lin *et al.* (1974) have discussed and figured a single upper molar of *Hylobates* sp. cf. *H. concolor* from a possibly later middle Pleistocene locality in Kwangsi; Chang *et al.* (1975) reported some teeth from the Pa-ma *Gigantopithecus* site in Kwangsi (mid?-middle Pleistocene); and Wu *et al.* (1975) indicated *Hylobates* sp. in their faunal list from T'ung-tzu, Kweichou Province (?later middle Pleistocene). Groves (1972) indicates that, while gibbons (*H. concolor*) today are restricted to southern Yunnan, there is evidence that they existed along the Yangtze in Szechwan and perhaps Hupei, in southern Kwangsi, Kwantung, and perhaps northern Kiangsi in historical times, thus including the range of the known fossils.

The prehistoric distribution of the orangutan (*Pongo pygmaeus*) has recently been reviewed by Kahlke (1972), who summarizes most of the previous reports for China as well as southeastern Asia. Hooijer (1948) termed some Chinese material *P. p. weidenreichi*, but Kahlke doubted the distinction of this subspecies from evidence so far available. Orang remains have been reported to date from the Ho-shang-tung cave, Yunnan Province (Young, 1932; Bien and Chia, 1938; ?mid-middle Pleistocene); Hsing-an cave E, near Kuei-lin, Kwangsi Chuang Autonomous Region (P'ei, 1935; later middle Pleistocene); Shao-ch'un (Shao-hsin) cave, Kwangtung Province (Chang, 1959; ?later middle Pleistocene); Liu-ch'eng (*Gigantopithecus*-cave," Kwangsi Chuang Autonomous Region (Kahlke, 1961; P'ei, 1963; ?later early Pleistocene); Niu-shui-shan, Ta-hsin (*Gigantopithecus* site), Kwangsi Province (Kahlke, 1961; ?mid-middle Pleistocene); Chai-ts'un cave, Kwangsi (Wu *et al.*, 1962; age uncertain, probably later middle Pleistocene--Kahlke [1972] includes this site and the next two in the late Pleistocene, along with all the others except Liu-ch'eng, while the Chinese consider some of these to be of even earlier middle Pleistocene age); Shu-an cave, N. Kwangtung (Liu, 1962; age as above); Fei-shu cave, Kwangsi (unpublished, noted in Kahlke, 1972); Pa-ma district (Kwangsi) *Gigantopithecus* site (Chang *et al.*, 1975; ?mid-middle Pleistocene); and T'ung-tzu, Kweichou Province (Wu *et al.*, 1975; age ?later middle Pleistocene). Today, of course, the orangutan is restricted to Borneo and Sumatra, but it extended in the middle (and early?) Pleistocene into southern China, probably contracting its range south through the late Pleistocene--Kahlke (1972) reported some "postglacial" teeth from northern Vietnam, so it remained on the mainland at least that long.

Miocene Hominoids

Among extinct Chinese hominoids, the most questionable is Schlosser's (1924) report of *Pliopithecus posthumus* from the probably Pliocene deposits of Ertemte, Mongolia. I have studied the single worn upper molar (in Uppsala), but I must follow previous workers in questioning its identification at present. It could possibly represent a suid, a hominoid, or some other mammal.

More interesting are two lots of associated lower teeth from the Hsiao-lung-t'an lignite, K'ai-yüan district, Yunnan Province. The most recent review of the Hsiao-lung-t'an fauna (Chang, 1974) suggests a later middle Miocene, pre-*Hipparion* date, comparable to the Chinji "zone" of the Siwaliks. The primates were first reported by Woo (1957), who described five lower cheek teeth as *Dryopithecus keiyuanensis*, comparing them mainly with Siwalik *D. punjabicus*; five more teeth were reported later (Woo, 1958), with a larger size attributed to sexual dimorphism. Chou (1958) and later Simons and Pilbeam (1965) considered that the first set was indistinguishable from *D. punjabicus*, which Simons (1964) had transferred to *Ramapithecus*, while the larger teeth might be of *Dryopithecus* cf. *sivalensis*. Given the present state of our understanding of intraspecific variability of *Dryopithecus*, I consider it doubtful that the two lots of teeth are conspecific, their size differences being larger than that due only to sexual dimorphism. Instead, I would concur with earlier workers that two species are present. Professor Woo (Wu) Ju-kang was aware of these arguments, but perhaps more prudently he preferred to recognize only one species for the finds.

Only brief notes might be added to Woo's excellent descriptions: the set of larger teeth (catalogued as PA 82, not An-612, the cast number used by Simons and Pilbeam, 1965) includes the right P_3-M_3 , probably of a single individual, with cingulum almost nonexistent; these teeth are most similar in size and morphology to those now termed *D. indicus* (a cast of American Museum of Natural History no. 19413, the "type" of "*D. frickae*," was used for comparison), except that P_4 is somewhat shorter and broader; I would thus identify this specimen as *Dryopithecus* cf. *indicus*. The original lot of teeth (PA 75/1-5), the type of *D. keiyuanensis*, consists of the damaged right and left P_4 (75-1 and 75-2) and the complete $R M_2$ (75-3), $L M_2$ (75-4) and $R M_3$ (75-5), presumably of a single individual of unknown sex. The teeth compare favorably in size and form with those of *R. punjabicus* from the Siwaliks, being rather larger than those of *D. laietanus* and somewhat smaller than those of *D. sivalensis*, as well as rather straight-sided as in *Ramapithecus*. This association of *Dryopithecus* cf. *indicus* and cf. *Ramapithecus punjabicus* is mirrored to the west in the Siwaliks and in sites of roughly equivalent age in central Turkey. These specimens represent the farthest eastward extent of the two genera now known and demonstrate once again an association with a forest fauna. Newspaper reports (indicated to me by Professor K. C. Chang) announced the recent recovery of numerous additional specimens whose publication is eagerly awaited.

Gigantopithecus

The most fascinating of Chinese nonhuman primates (and perhaps of all Chinese fossils) is, of course, *Gigantopithecus*. As is by now well known, von Koenigswald (1935) found the first reported specimen, an isolated M_3 , in a group of "dragon bones" bought in a Chinese pharmacy in Hong Kong in 1935 (see von Koenigswald, 1952, for a brief history). He recovered numerous other isolated teeth in his "drugstore fauna" and described all those in his possession (eight) in 1952. In 1955 (see P'ei,

1957), the IVPP began an intensive campaign to discover the exact source, age, and affinities of *Gigantopithecus blacki*, which had previously been considered everything from an aberrant giant ape to the ancestor of man. The source of the fossils was traced to the southern provinces of Kwangtung and Kwangsi, and in 1956 three molar teeth were found *in situ* in a cave variously termed the Hei-tung (Black cave) on Niu-shui-shan Hill in Ta-hsin district of southern Kwangsi.

The next year, P'ei led the Kwangsi working team back to explore other regions of the province. A farmer digging for fertilizer in a cave in Liu-ch'eng district in central Kwangsi "discovered a quantity of fossil bones and, being persuaded by a governmental employee, presented all the fossil bones to Academia Sinica for investigation" (P'ei, 1957, p. 66). This cave, now termed *Gigantopithecus*-cave number 1, is located about 90 m above present ground level in an isolated hill or karst tower known as Leng-chai-shan about 0.5 km south of Hsin-shüeh-chün-ts'un village. The plan of the cave and an interpretation of its formation were presented by P'ei (1957, 1965) and most recently by White (1975). Between 1956 and 1960, three partial mandibles and 984 isolated teeth of *G. blacki* were found in this cave. A second cave (number 2) yielded an additional 22 teeth in 1959-1960, while 48 teeth were recovered from the Kwangsi and Kwangtung drugstore supply houses. All of these specimens were described, many illustrated, and all original measurements were given by Woo (1962). Eckhardt (1973) has recently summarized the measurements and provided some statistics that Woo did not calculate.

Three additional small collections of *Gigantopithecus* teeth have been reported in recent years, and these materials were discussed with us in Peking by Chang Yin-yün. In 1964-1966, an IVPP team found 13 teeth in the Wu-ming district of Kwangsi Chuang Autonomous Region (Chang *et al.*, 1973). An additional M_3 was found in a karst cave in Pa-ma district in 1973 (Chang *et al.*, 1975). Most interesting of all is the association of five teeth of *G. blacki* with four molars of a smaller hominid primate (see below) in Dragon Bone cave, Chien-shih district, western Hupei Province (Hsu *et al.*, 1974; "Gao Jian," 1975).

The precise age of these faunal assemblages has been discussed by many workers, but the current opinion in the IVPP seems to follow Chou (1958) in assigning a (later) early Pleistocene date to the Liu-ch'eng cave(s). *Mastodon*, *Tapirus* (?*Megatapirus*), *Doracabune*, *Hystrix magna*, *Ailuropoda microta*, and *Stegodon praeorientalis* are all present in Liu-ch'eng but absent in typical middle Pleistocene sites in southern China, including Ta-hsin, Wu-ming, and Pa-ma (see also Kahlke, 1961). Of these, only a mastodont appears to be present at Chien-shih (Hsu *et al.*, 1974), but Chang and Chou both indicated that the latter was of intermediate age, and Chou suggested it would be close to the local early-middle Pleistocene "boundary."

As to the fossils themselves, they have recently come back into the spotlight as several authors have tried to suggest that *G. blacki*, or at least *G. bilaspurensis* (= ? *giganteus*), might have been ancestral to later hominids. Corruccini (1975), Delson and Andrews (1975), and others have echoed Pilbeam (1970) in rejecting this view, arguing that *Gigantopithecus* possessed a number of fundamental adaptations demonstrating it to be far removed from relationship with the ancestry of *Homo* (see discussion

in Delson *et al.*, 1977). As to the argument that if size alone is considered, *G. blacki* might well have reduced its dentition to the size seen in *Australopithecus* or *Homo* in the time allowed with only a small change per generation, this is essentially irrelevant. Following such an argument, it could be suggested that *Hyracotherium* of the early Eocene was in fact the ancestor of *Homo* (or any other mammal one chose), as the size changes required would be infinitesimal per generation. This view completely ignores morphology and its indication of adaptations and relationships in favor of a dependence on "might have beens" and simplistic analysis of measurements.

One point can be emphasized about the measurements of *G. blacki*, and that is the great variability to be seen in the Liu-ch'eng specimens. It is difficult to accept that a single species could have had such a spread of size as that observed. On the other hand, I plotted a histogram of P_4 length and width as given by Woo (1962), finding that there was no clear indication of polymodality, only a smear of both dimensions. It is possible that two similarly sized taxa are present, so that their overlap produces high but reasonable coefficients of variation (around 10), and in fact Woo grouped specimens into two lots, thinking they were sexes; it is also possible that a long interval is represented, with size varying over time. Only more detailed study of the range of *morphological* variation will allow a further comment on this problem.

It can further be mentioned that the teeth from Pa-ma and Wu-ming appear somewhat larger than those from Liu-ch'eng, suggesting to Chang *et al.* (1975) that the species may have increased in size, rather than decreasing with time, although the small younger samples do not permit confident assertions. As they noted, this is another argument against the idea of Weidenreich (1945) and others that *G. blacki* might have been ancestral to *Homo*. The apparent complete lack of cranial and postcranial elements is a final most perplexing aspect of the taphonomy of *Gigantopithecus*.

SUMMARY

In this chapter I have tried to indicate the main locales of vertebrate paleontological research in China and their interests; to summarize some of the most important recent results, concentrating on Paleocene mammal finds and Plio-Pleistocene faunal and stratigraphic studies; and to review all known occurrences of nonhuman primates. The first section draws heavily on what I and other delegation members actually saw and were told in China, while the second includes much from the literature and also from the report of the Australian Quaternary delegation, which visited China in late 1975. The detailed discussion of fossil primates is based on both literature and first-hand studies, in China and elsewhere. By way of further summary of this latter section, I have prepared a tentative correlation chart of late Pliocene and Pleistocene localities yielding nonhuman fossil primates (Table 4) and a brief classification of known taxa, with localities indicated for pre-Pliocene forms (Table 5).

TABLE 4 Outline Stratigraphic Distribution of Chinese Plio-Pleistocene Nonhuman Fossil Primates

Age	Localities and Included Primates ^a
"Holocene"	Hsien-jen (M)
Late Pleistocene	
Later middle Pleistocene	Ch'ing-shih-ling (M) Fei-shu (P) Hei-ching-lung-ts'un (M) Ho-shang-p'ao (M) Hsing-an Cave E (P) Ko-lo-shan (M) Kwangsi Cave localities 6146, 6148, 6151 (M) Shao-ch'un (P) Shu-an (M,P) Tan-ying (M) T'ung-tzu (H,P,R) Yung-an (M) Chai-ts'un (P) [??Kwangsi Cave (H)]
Mid-middle Pleistocene	Chou-k'ou-tien localities 1 (M) 2 (M) 3 (M) 13 (M) Kung-wang-ling (M) Ho-shang-tung (P,R)
Early middle Pleistocene	Pa-ma (G,H,M,P) Ta-hsin (G,P) Wu-ming (G,M) Yen-ching-kou I (H,R) Chien-shih (G)
Early Pleistocene	Liu-ch'eng (G,M,P,R) Mien-ch'ih (M)
Late Pliocene	Chou-k'ou-tien 12 (Pc) Hsin-an (Pc) Ku-ti-ts'un (Pc) Yü-she (Pc)

^aKey to abbreviations for primate fossil taxa: G = *Gigantopithecus*, H = *Hylobates*, M = *Macaca*, P = *Pongo*, Pc = *Procynocephalus*, R = *Pygathrix* (*Rhinopithecus*).

Note: Localities grouped in a single age range are approximately the same age, except where separated by spacing. Thus, Ch'ing-shih-ling and Chai-ts'un are roughly the same age, but Chien-shih is older than Yen-ching-kou.

TABLE 5 Outline Annotated Classification of Chinese Fossil Primates

Taxon	Localities	Stratigraphic Age
Adapidae		
<i>Lushius qinlinensis</i>	Men-chia-p'y	Early late Eocene
<i>Hoanghoniuss stehlini</i>	Jen-ts'un, new locality	Late late Eocene
Cercopithecidae		
<i>Procynocephalus wimani</i>	see Table 4	Late Pliocene-early Pleistocene
<i>Macaca</i> spp. (incl. <i>M. anderssoni</i> , <i>M. robusta</i> , etc.)	see Table 4	?Early Pleistocene-modern
? <i>Macaca</i> sp. indet.	Wu-tu	?Late Miocene
<i>Pygathrix (Rhino- pithecus)</i> sp.	see Table 4	Pleistocene-modern
Hominidae (sensu Delson and Andrews, 1975)		
<i>Hylobates</i> sp. (incl. <i>Bunopithecus sericus</i> , etc.)	see Table 4	Middle Pleistocene-modern
<i>Pongo pygmaeus</i>	see Table 4	Pleistocene
<i>Dryopithecus (S.)</i> cf. <i>indicus</i> (= <i>D. keiyuanensis</i> partim)	Hsiao-lung-t'an	Late middle Miocene
<i>Gigantopithecus blacki</i>	see Table 4	Early middle Pleistocene
cf. <i>Ramapithecus punjabicus</i> (= <i>D. keiyuanensis</i> type)	Hsiao-lung-t'an	Late middle Miocene
?Anthropoidea incertae sedis		
"Kansupithecus"	Taben Buluk region	?Middle Miocene
?Artiodactyla		
<i>Lantianius xiehuensis</i>	K'ung-kou-wan	Early Oligocene
Order incertae sedis		
<i>Pliopithecus posthumus</i>	Ertemte	?Pliocene

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Paleoanthropology in the People's Republic of China

A Trip Report of the American Paleoanthropology Delegation

Edited by W. W. HOWELLS and PATRICIA JONES TSUCHITANI

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