中國科學院古脊椎動物研究所

Institute of Vertebrate Paleontology, Academia Sinica

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TZEYANG PALEOLITHIC MAN

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內 容 提 要

本專刊是1951年在四川資陽縣發現的哺乳動物化石，人類頭骨化石和一個骨針的綜合研究報告。內容共分四部分：第一部分敍述化石發見的經過，發掘地點地層的觀察以及各種化石的一般性質；第二部分敍述人類頭骨化石的特徵，和它在人類進化系統上的地位以及它的意義；並附有資陽骨針的研究簡單報告；第三部分敍述對哺乳動物化石的研究結果；第四部分爲全部內容簡單的提綱。 可供古生物學、人類學、生物學、考古學、地質學、歷史學、博物館工作者的參考。

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I. 四川資陽人類化石及其他脊椎動物化石的發現經過和一般論述

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一、發現及發掘經過

1951年修建成渝鐵路的工人們在資陽黃鱔溪挖掘橋基時，發現了許多哺乳動物的化石。當時的西南軍政委員會文教部，爲了配合工程進行而組織一個"文物調查徵集工作小組"[1]，這個小組收藏和保存了這些化石，內中包括一個人類化石的頭骨。

資陽黃鱔溪橋基旁發現了化石人類頭骨的一件事，引起了各方面的特別重視，大家都認爲有作進一步研究的必要。當時的中國地質工作計劃指導委員會特派裴文中前往調查發掘，並有重慶大學張聖奘教授、任朝鳳同學，西南文教部晏學、蔡佑芬，西南地質調查所李伯皐，西南博物院徐鵬章及重慶市文化局何九恩等同志參加了這個工作。

由1951年9月27日開始，在資陽黃鱔溪橋一號橋墩西掘了15 × 7.1平方米，和橋東掘了13.7×7.3平方米的兩個長方形的坑。據張聖奘教授談，人類化石頭骨即發見在一號橋墩與我們所掘的東坑的中間（參閱圖1）。

至同年10月30日將含化石的小礫石層（圖2之泥沙礫石層）完全掘完，又掘了一部分不含化石的大礫石層之後，我們結束了工作。一共掘了橋東約480立方米加橋西590立方米總共1070立方米的土石，除了續得一些動植物化石及一骨椎外，沒有得到更多的人類化石。

我們現將發掘地點的觀察及所發現的化石的一般性質，敍述於下。至於植物化石，已交地質部徐仁教授進行研究。

二、附近的地形和發掘地點地層的研究

發掘地點在成渝鐵路資陽車站西南，資陽縣城西約半公里之處，位在黃鱔溪河的南岸。因爲挖掘黃鱔溪大橋橋基，發見了地面下約七、八米處有樹幹及動物骨骼化石，而進行了採集和發掘的工作。

資陽縣城南三里餘，有東南和西北方向的天台山，北有東西方向的北岳山，城東是沱江，黃鱔溪河由西北流入這兩條山的中間，冲積成了一個小平原。河流在這個小平原

上更爲迂迴、展轉冲流到資陽城東南三里多的地方入了沱江。這條黃鱔溪河，在這個小平原上，已經到了"老年時期"，主要現象是河身彎曲很大，時有兩彎直接溝通的事，彎曲處成了淤河。 在1949年資陽解放之前，黃鱔溪河入沱江的近處，兩個彎曲的地方在漲水的時候互相溝通了。

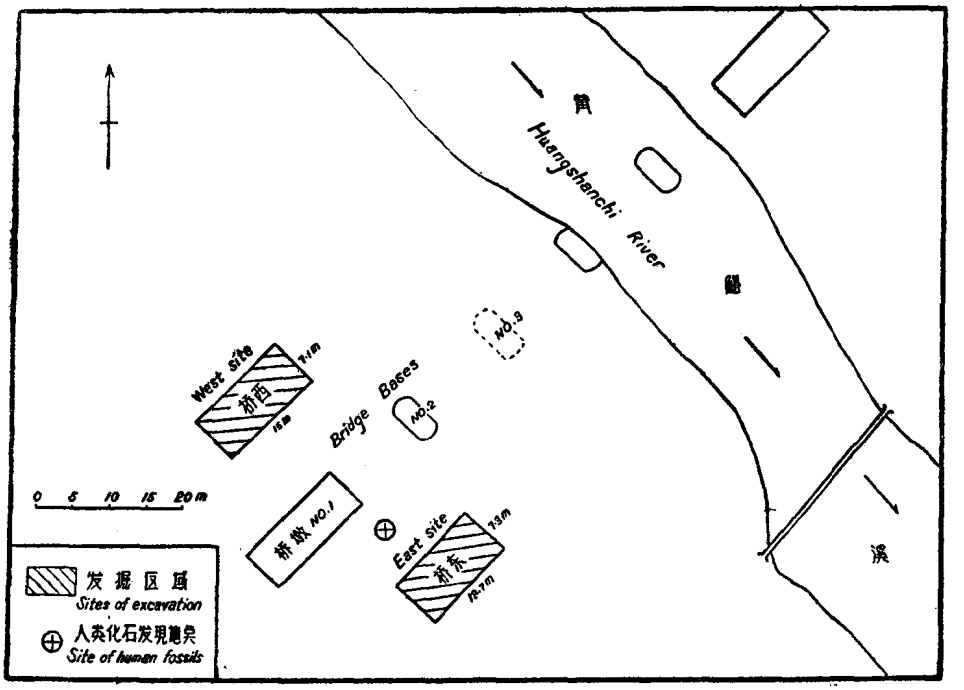

圖1 發掘區域平面圖 (Fig. 1 Plan of the Site of Excavation)

如剖面圖所示(圖2)，黃鱔溪附近的上部，覆蓋着一層紅黃色粘土，平均有6米厚，大約相當於華北區域的"黃土"，這是第一層。

紅黃色粘土的下邊，也是粘土，但顏色深灰，裏邊含有大量已經腐爛了的有機物，也有少量成層的細砂粒，平均約有1米厚，這是第二層。

灰色粘土的下邊，是一層含砂和小礫石的地層，這是第三層，約爲1至1.5米厚。這層還可再分上下兩部。 上部多砂，小礫石少，顏色深黃，裏邊有保存完好的樹葉和巨大的樹幹。這許多大樹幹，都平臥在地層裏，枝葉和根鬚也都保存生時的連接狀態。樹幹都是尖向東南，根向西北，已變成黑色，濕時微呈淺綠或黃色。當地人民叫它爲"烏木"，又有叫它爲"陰沉木"的。實際上，已成了化石。 也有少量骨化石，大多保存完好，人類頭骨化石，可能是由這部分掘出來的。

第三層的下部，砂少而粗，小礫石較多，內有骨化石，但無樹木化石。骨化石多爲零星破碎者，且有被水冲磨的痕跡。

第三層下的一層（第四層）裏邊所有的礫石愈向下就愈多而愈大，砂粒愈少以至於

沒有，沒有骨化石，也沒有樹木化石。 這一層下部已完全是大礫石，因爲我們停止了挖掘工作，厚度不知道。

如以上所述，我們雖將地層分爲四層，但是各層中間並沒有明顯的界限，都是漸漸變化的。 總起來說，就是上部是粘土下有砂粒，再下有小礫石，再慢慢向下，礫石變大，砂粒漸小，終至於完全沒有了砂土而全爲大礫石。 這種情形，應當是一個系統，一個連續的地質現象。

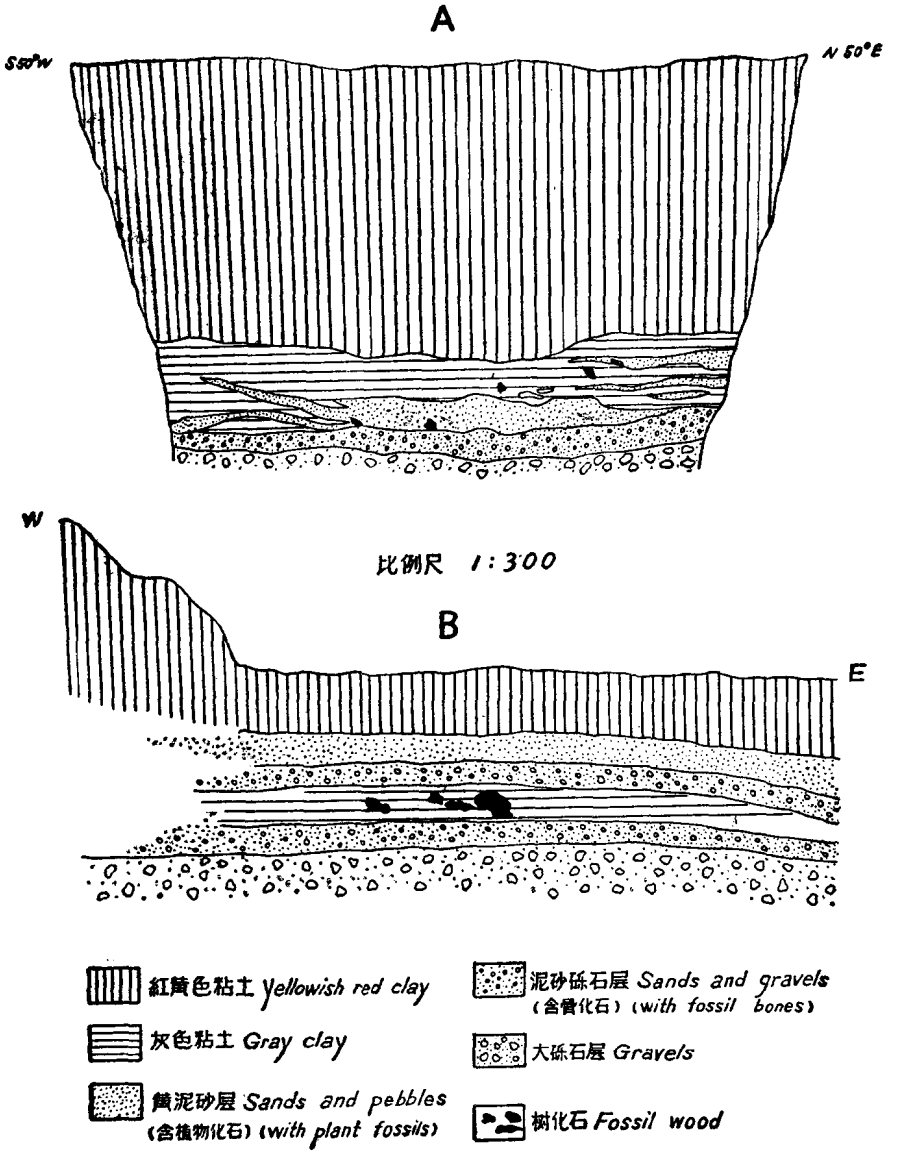

圖2 發掘地點剖面圖(Fig. 2 Vertical Section of the Site of Excavation)
A. 橋西西牆剖面 (West Site)； B. 三號橋墩剖面 (Bridge Base No. 3)。

三、各種化石含氟量的分析和比重的測定

因爲由資陽所採的化石，顯然有石化程度較深和較淺的兩種，所以爲了分別這兩種化石是否同一年代，首先作了含氟量的分析。分析的結果，已由邱中郎寫成短文發表[2]。

資陽化石中，一共分析了 6 塊標本，其中包括人的頭骨化石。分析的標本多是破碎的，沒法鑑定種屬，現將含氟量的分析結果列表如下。

樣品號碼	化 石 種 類	從外表認爲的石化程度	含氟量%	比重
14	不能鑑定	石化程度很深	1.32	2.4
13	脊椎骨	石化程度中常	1.16	1.9
5	似爲虎的脛骨下端	石化程度較深	1.11	1.9
16	人的頭骨	石化程度較淺	0.79	—
12	鹿類脊椎骨	石化程度最淺	0.75	1.6
15	似爲犀牛的尺骨上端	石化程度較深	0.71	2.3

就含氟量的百分率來看，這六種樣品，顯然地分爲兩組，一組是 14、13 和 5 號，含氟量最大爲 1.32，最小爲 1.11，最大差別爲 0.21。另一組是 16、12、15 號，最大爲 0.79，最小爲 0.71，最大差別爲 0.08。兩組間最小的差數是 0.22。

由這個分析看來，資陽黃鱔溪的化石可以分爲兩個時代，似乎沒有很大的問題。這個分析也與哺乳動物的研究，分爲兩個時代的化石正相吻合。但是問題在於哪一種動物的化石屬於古老的，哪一種屬於晚近的。因爲作含氟量分析時，怕損毀了標本，都沒有分析可以鑑定種屬的標本。

現在我們再用比重的測量方法，尋求上述問題的解決。

牙齒與體骨的比重原本不同，所以我們只用牙齒和牙齒比，用相同部分的骨骼相比，其結果如下*：

號 碼	動 物 化 石	比 重	號 碼	動 物 化 石	比 重
1	猛獁象牙	1.99	4216	牛上牙(白色者)	1.86
2	東方劍齒象牙	2.32	76A	牛上牙(黑色者)	2.10
3	東方劍齒象牙	2.26	4215	牛下牙(白色者)	2.79
4179	犀牛前臼齒	2.24	76B	牛下牙(黑色者)	2.31
181	犀牛前臼齒	2.02	4214	牛下牙(白色者)	2.22
4	水鹿鹿角	2.13	5	牛下牙(黑色者)	2.20
96	鹿角(年青者)	1.30	4183	馬上牙	2.18
42	麝鹿肩胛骨	0.85	4184	馬上牙	1.99

由上述的表，可以說明什麼呢？我們認爲可以說明下列幾個問題：

1. 麝鹿的肩胛骨，比重只有 0.85 (42 號)，而水鹿的鹿角的比重是 2.13，相差很多，

* 各種骨化石比重的測量，是由我室黃萬波同志作的，曾作了三次，這是第三次的數字，認爲是較正確的。

可能是受了不同程度的石化作用。而且肩胛骨是容易破碎的，但却保存完好。另有許多水鹿的踝骨，都經水冲磨，差不多成了"礫石"（如本專刊第三部分如圖版 V，圖 12 所示），沒有問題，這個標本在水中冲流得相當的遠。我們認爲：至少是這兩個標本，屬於不同的保存情況，很可能代表兩個時代的化石。

2. 麂角（96 號）與水鹿角（4 號）的比重也差得很多，是 1.30 和 2.13，也有好多水鹿角，曾經有在水中冲磨的痕跡，因此，我們也可認爲麂比水鹿的生存時代晚一些。

3. 猛獁象（1 號）與東方劍齒象（2 號、3 號）的比重是 1.99 和 2.32，也有一定的差別，再加東方劍齒象的牙齒大部分是破碎的，且有冲磨過的，也許我們可以認爲猛獁象和東方劍齒象不是同一時代的動物，猛獁象比東方劍齒象的時代較晚一些。

4. 牛和馬的牙齒，從比重上很難分別石化的程度，因爲這兩種動物的牙齒，內部石灰質的密度很大，礦物質浸入較少，所以在石化和未石化之前，比重都差不多。雖然如此，資陽的犀牛的牙齒平均的比重比馬的牙齒的平均比重要大些，也許，我們可以認爲馬比犀牛晚一些。

我們從化石比重的分析和前述的含氟量的分析，似乎可以肯定：由資陽黃鱔溪所採的化石，包括兩個不同時代的動物羣：一個動物羣，時代比較晚，計有：人（*Homo sapiens*），馬（*Equus* sp.），麂（*Muntiacus* cf. *reevesi*），麝（*Moschus* sp.），猛獁象（*Mammuthus primigenius*）。

另一個動物羣，時代比較早，計有：犀牛（*Rhinoceros* cf. *sinensis*），水鹿［*Cervus* (*Rusa*) *unicolor*］，東方劍齒象（*Stegodon orientalis*）。

至於鬣狗（*Hyaena* sp.），虎（*Felis tigris*），箭猪和竹鼠（*Hystrix* and *Rhizomys*）猪（*Sus* sp.），犎牛（*Bibos gaurus*）則屬於哪一個動物羣，都不能鑑定，很可能兩個動物羣中都有。

犀牛、水鹿和劍齒象的動物羣，與江南山洞中的猩猩（*Pongo*）、熊貓（*Ailuropoda*），劍齒象動物羣是相同的，特別與四川鹽井溝的動物羣，地質時代同是更新世中期。雖然，在資陽我們並沒有發見猩猩和熊貓的化石——可能是因資陽黃鱔溪區域不適宜於這兩種動物生長的緣故。

時代較晚的人、麂和猛獁象動物羣，很可能是在江南的另一種分佈也很廣的，更新世晚期的動物羣，但是到現在還很少發現*。當然，麂也可能發現於較老的動物羣之中，如北方的動物羣†。猛獁象出現在四川的更新世，似乎是一件不尋常的事。

在前邊已經由含氟量的分析講過了，資陽的人類化石是屬於後一個麂和猛獁象的動物羣的。這個說法，與吳汝康根據化石形態研究的結果，也相符合。

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* 1956 年在廣西山洞中也發現了一種類似的動物羣。

† 北方的麂化石已於上新世地層中出現。

四、地質、地層、古生物綜合觀察小結

綜合上述的對地質地層和古生物的觀察和分析，我們對黃鱔溪這個出產化石地點的意見，使我們在總的方面還沒有理由改變在 1952 年的簡報中的結論[3]。但須稍加補充。現在我們可總結爲下列幾點。

1. 當更新統中期的時候，在成渝鐵路黃鱔溪大橋附近，黃鱔溪的河流還很急，在河灘生成了巨大礫石層(第四層)。這時在河岸的兩旁，生長着林木，也有沼澤低濕的草地，有犀牛、劍齒象和水鹿生長在這裏，它們的遺骸留在河岸旁的堆積物之中。

2. 到了更新世晚期，黃鱔溪河流迂迴彎曲，水流離這裏遠了一些，也漸漸遲緩下來，生成了小礫石和砂的堆積，河岸兩旁生活着猛獁象、麂和人。它們的遺骸和從前在河旁的含骨化石的堆積冲到河灘上，混在小礫石和砂的堆積中。生成了第三層堆積物。

3. 後來河流迂迴得更遠了一些，彎曲也更大了，河水的速度也減小了，舊的河灘上生長了樹木和水草，在洪水期間將樹木冲倒，泥砂淤積起來，這樣生成了第二層堆積物。

4. 最後，河流迂迴得更遠了，當地氣候也比較乾燥了，兩岸堆積了一層相當厚的紅黃色粘土。

5. 到了現代，黃鱔溪的河流又迂迴到了這裏，但是河水水面較深了，又將這個地方的各層堆積冲蝕成不高的斷崖，就是現在我們看到的這樣的地形。

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I. INTRODUCTORY NOTES ON THE DISCOVERY OF HUMAN AND VERTEBRATE FOSSILS IN TZEYANG DISTRICT, SZECHUAN PROVINCE

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1. HISTORY OF THE DISCOVERY

In building the foundations for a bridge crossing the River Huangshanchi in Tzeyang District, Szechuan Province along the Chentu—Chungking railroad, the workers there discovered in 1951 numerous mammalian fossils, including one human skull in the layer of sands and gravels, about 7–8 meters below the land surface. Highly interested by these finds, the former Geological Directing Committee of China sent the author to Tzeyang to survey the site and to make further scientific excavation.

The excavation was joined by Prof. Chang Sheng-chuang of Chungkiang University, and Messrs. Li Bo-kao, Ho Chiu-ssu, Hsu Peng-chang, Jen Chao-feng, Yen Hsueh and Tsai Yu-fen of Chungking Museum and Geological Survey.

The excavation was started on 27th September, 1951 and suspended on 30th October that year. The human skull is said to be dug out from the place marked with cross in circle in Fig. 1 on page 2 in the Chinese text. The excavation was carried out mainly in two areas: about 480 cubic meters in extent on the west of the bridge and about 590 cubic meters on the east.

Besides the mammalian fossils and other vertebrate remains, we have also collected a great number of fossil trees and leaves of various plants which are now under investigation of Prof. Hsu Jen, Palaeobotanist of the Ministry of Geology.

2. STRATIGRAPHICAL OBSERVATIONS OF THE SITE

The fossiliferous locality is situated about 0.5 km west of Tzeyang city, on the right bank of Huangshanchi River.

At the south of the Tzeyang city there are one hill range named Tientaishan running in NW to SE direction and another named Peiyao-

shan on the north. The Huangshanchi River flows from northwest into the two hill ranges and becomes confluent with the To-Kiang River at the east of the city.

A small alluvial plain was formed in this area by the Huangshanchi River which has already reached its old stage of development indicated by the strong meandering of its course and the presence of the ox-bow lakes.

As shown in Fig. 2 on page 3, the upper part of the section consists of a layer of yellowish red clay about 6 meters average in thickness, which is very similar to the "Loess" of North China.

Underneath the yellowish red clay is a layer of dark gray clay in which contains a large number of decayed organisms (Fig. 2) and some thin layers of fine sands.

Below the gray clay layer, there is a layer of yellowish sands and small pebbles, from 1 to 1.5 meters thick (Fig. 2). Remains of big trees still with roots, branches and leaves are abundant and lying horizontally with all their tips pointing to south-east and roots to north-west. The trunks of the trees became carbonized and bear greenish or yellowish color when wet. A few fossil bones occur in this layer. It is reported that the fossil human skull might be unearthed from this layer.

In the lower part of this layer, sands become coarser and pebbles larger; fossil bones are all fragmentary and rolled; and fossil trees rare.

Underneath the third layer is the fourth layer, in which the pebbles gradually increase in size and sands are diminishing. No more fossil bones or fossil trees were found. Below this layer, the gravels, absence of fossils, become bigger and bigger. We stopped our excavation here.

Though we subdivided the sections into four layers as described above, in fact no sharp boundary could be observed between the adjacent layers. Generally speaking, in the Huangshanchi locality, there is one layer of fine clay, chiefly formed by decomposition of the local materials on top. When getting deeper and deeper the grains of the material become coarser and coarser and at last it arrives to the formation of gravels.

This changing of deposition would indicate the frequent changing of water course during Pleistocene time. At the present place, the Huangshanchi River, at first, flowed with torrential water, later became calm and less-flowed and finally shifted to some other places. At the last stage no more sedimentation of water origin was formed in this place, but only diluvium.

3. Fluorine Contents and Specific Gravity of the Fossil Bones

Fossil bones collected from Tzeyang are evidently divisible into two kinds in the state of fossilization: one light in color and less fossilized and the other dark in color and strongly mineralized. Fluorine tests were executed in giving more evidence for the above statement.

Among the Tzeyang fossils fluorine test was made on six pieces of bones, including that of the human skull. The results are giving in the following table:

Sample No.	Fossils	Degree of Fossilization	Fluorine contents (%)
14	undeterminable	strongly fossilized	1.32
13	vertebra	moderately fossilized	1.16
5	tibia, *Felis tigris*	strongly fossilized	1.11
16	human skull	slightly fossilized	0.79
12	vertebral spine, Cervidae	slightly fossilized	0.75
15	Radius, ?*Rhinoceros*	moderately fossilized	0.71

The percentages of fluorine centents of the above samples naturally fall into two groups: one consists of the samples Nos. 14, 13 and 5, in which the largest is 1.32, the smallest, 1.11, and the maximum difference is 0.21; the other consists of the samples of Nos. 16, 12 and 15, in which the largest is 0.79, the smallest, 0.71, and the maximum difference is 0.08. The minimum difference between two groups is 0.22.

According to the percentages of fluorine contents of these samples, the fossil bones of Huangshanchi may be interpreted as belonging to two different ages. This statement also agree with the study of mammalian fossils in Part III of this Memoir, though only a few samples was practised in fluorine analysis.

The specific gravity of the fossil bones was determined by Mr. Huang Wan-po of our Institute. Because the teeth of one animal is much heavier than the bones of the same animal even in the living forms, therefore, we compare only the specific gravity of similar teeth and bones of similar animals. The results of 16 samples are given in the following table:

No. of specimen	Fossils	sp. gr.	No. of specimen	Fossils	sp. gr.
1	tooth, mammoth	1.99	4216	white colored upper tooth, Bovidae	1.86
2	tooth, *Stegodon*	2.32	76A	black colored upper tooth, Bovidae	2.10
3	tooth, *Stegodon*	2.26	4215	white colored lower tooth, Bovidae	2.79
4179	premolar, *Rhinoceros*	2.24	76B	black colored lower tooth, Bovidae	2.31
181	" "	2.02	4214	white colored lower tooth, Bovidae	2.22
4	antler, *Rusa*	2.13	5	black colored lower tooth, Bovidae	2.20
96	antler, *Muntiacus*	1.30	4183	upper tooth, horse	2.18
42	scapula, ?*Moschus*	0.85	4184	" "	1.99

What can we deduce from the above table? Four points are worth to be mentioned here:

(1) The scapula of ?*Moschus* gives the specific gravity only of 0.85, and it, though easily breakable, was found completely intact; while that of the antler of *Rusa*, 2.13, and its astragalus was strongly rolled (Pl. V, fig. 12) like a water-worn pebble. It is, thus, possible that the bone and antler of *Rusa* had been more strongly fossilized than those of ?*Moschus* and they were transported by running water for a long distance and the bone of ?*Moschus* remained in the original place.

(2) The antler of *Muntiacus* is complete, without water-worn trace and its specific gravity is 1.32. On the other hand, antlers of *Rusa* are always broken, bear the trace of water wear, and all have somewhat larger specific gravity. Thus, we are inclined to suggest that *Rusa* is older in age than *Muntiacus*.

(3) When we compare the tooth of the mammoth with that of *Stegodon*, the specific gravity of the former is somewhat smaller than that of the latter. Furthermore, the teeth of *Stegodon* are always fragmentary and strongly rolled. Perhaps we are not mistaken if we assume that *Stegodon* is older than the mammoth in Tzeyang.

(4) Teeth of both Bovidae and horse show no great difference in specific gravity, even though they are different in color. This is perhaps

due to the great density of the cement of these teeth into which only a little inorganic matter could be penetrated. However, there are some teeth being rolled and the others not. Perhaps Bovidae and *Equus* are the common forms in both faunas.

The specific gravity of *Rhinoceros* teeth is generally greater than that of the horse, but, in fact, the tooth of *Rhinoceros* usually contains more light matter such as dentine than that of the horse. Thus, it seems that *Rhinoceros* is also an old form in Tzeyang.

From the foregoing analysis, the following tentative conclusions can be drawn.

The mammalian fossils of Huangshanchi are the mixture of two groups: One is later in age, including *Homo sapiens*, *Equus* sp., *Muntiacus reevesi*, ?*Moschus* and *Mammuthus primigenius*. All are slightly fossilized, containing small percentage of fluorine and not worn by water. The second group consists of the *Cervus* (*Rusa*) *unicolor* aud *Stegodon orientalis*. Contrary to the first group, they are all strongly mineralized, with greater fluorine content, water rolled, and older in age.

Not mentioned above are the forms, *Hyaena* sp., *Felis tigris*, *Sus* sp., *Hystrix* sp. and *Rhizomys* sp. which perhaps are present in both groups.

Pongo sp., *Ailuropoda* and *Megatapirus* are three common fossils known in association with *Stegodon orientalis* in cave deposits of Middle Pleistocene in South China but deprived from the present locality.

The man, Muntjac and Mammoth fauna of later age in Tzeyang are so far not known in other places of South China. Future research on South China caves may, however, throw some light on it.

4. General Conclusions on the Geological and Palaeontological Observations

From both geological and paleontological study as stated above, it seems unnecessary to alternate the conclusions arrived at by the author in 1952 in a preliminary report on *Sinitia* (Ko-Hsueh-Tung-Pao), p. 709. Here we may repeat them with some details:

(1) During Middle Pleistocene time, near the Huangshanchi bridge of Chengtu-Chungking Railroad, the Huangshanchi river was flowing torrentially and forming the large-sized gravel bed as the fourth layer. On both