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Searching for the Early Neolithic in China

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ABSTRACT - *The purpose of this paper is to present and interpret the archaeological data on the earliest ceramic assemblages in China that may not be otherwise available to archaeologists working outside China. I will focus on nine sites, which I believe correspond to the earliest Neolithic cultures with archaic pottery in China.*

POVZETEK - *Namen članka je predstaviti in interpretirati arheološke podatke o najstarejših keramičnih najdbah na Kitajskem, ki morda niso dostopne arheologom izven Kitajske. Osredotočili se bomo na devet najdišč, ki po našem mnenju odgovarjajo najstarejšim neolitskim kulturam.*

INTRODUCTION

Pottery making is considered one of the most important inventions in human history. In China, pottery is thought either to signify the appearance of the Neolithic period or to represent one of the fundamental features of the period (*Yu 1987; An 1997*). Therefore, exploring the origins of pottery is a key to understanding Early Neolithic cultures.

In northern China, the lack of Early Neolithic remains was mentioned by Swedish geologist J. G. Andersson as early as the 1920s, when he excavated the first Neolithic culture, the Yangshao culture, in the Yellow River valley (*Andersson 1925*). In the 1930s, a famous Chinese archaeologist, Xu Bingchang, thought he had found the Early Neolithic culture in Shaanxi province when his team excavated the Doujitai site in the middle Yellow River valley. But this discovery attracted no attention because of the Japanese invasion. Archaeological discoveries made in later years showed that his findings at the Doujitai site were the remains of the Longshan culture, a late Neolithic culture even later than the Yangshao culture (*Chen Xingcan 1997a.304-305*).

Some remains dated to the pre-Yangshao period were first discovered in Shaanxi province in the late 1950s.The Early Neolithic culture was then confirmed after the excavations of the Peiligang culture in Henan, the Cishan culture in Hebei and Laoguantai or Dadiwan I culture in Shaanxi and eastern Gansu provinces in the late 1970s (*Yan 1979; An 1979; Chen Xingcan 1997b*). But, these cultures, dated to about 7000-8000 BP, show the existence of an well-organised sedentary life, millet cultivation, and an advanced ceramic industry. They are too late to be considered Early Neolithic cultures, due to their maturity in agriculture and pottery-making technology and the time gap between the end of the Pleistocene (c. 12 000 BP in Northern China) and these Neolithic cultures. Therefore, those cultures are reconsidered as either the early period of the middle Neolithic or the late period of the Early Neolithic, and only cultures before this period can be identified as from the true Early Neolithic. A stone tool manufacturing site at Emaokou in Shanxi province and the tomb of "Donghulin Man" were discovered in the 1960s and were thought to be Early Neolithic remains.

Finally, the excavation at the Nanzhuangtou site, in Hebei province (*Baoding diqu wenguansuo 1992*) attracted the attention of archaeologists in the late 1980s, because this site yielded the earliest pottery and stone mortars and pestles, dated to about 10 000 BP.

The Yangzi River valley witnessed the finding of an Early Neolithic culture when an excavation was con-

ducted in the early 1960s at the Xianrendong site in Jiangxi province. But contradictory radiocarbon dates led to questions on the reliability of the data (*An 1989*). The Hemudu culture, excavated in 1973 in the lower Yangzi River valley dated to 7000 BP, promoted a revolution in the understanding of the prehistory of this region, which was previously thought to be very backward and uncivilised until the introduction of a more advanced culture from the Yellow River valley in dynastic times.

After a number of Neolithic cultures dated between 7000 to 8000 BP were discovered in the lower and middle Yangzi River valley, the problem of the Early Neolithic has been raised again (*He 1996; Chen Xingcan 1997b*). In 1977, two pottery sherds, associated with fossils of *Crocuta ultima Matsumoto* (an animal which existed in the late Pleistocene, but became extinct in the Holocene), were found at the Henxiandong cave site in Lishui county, Jingsu province. These pottery sherds, therefore, were considered as among the earliest Neolithic ceramic remains in China (*Li Yanxian et al. 1980*). The 1990s has brought a series of excavations related to Early Neolithic culture in the middle Yangzi River valley, and the material remains found at Xianrendong, Diaotonghua in Jiangxi province and Yuchanyan in Hunan province have revived discussions on Early Neolithic cultures (*Yuan 1996; Liu 1996*).

A number of sites containing archaic ceramics were discovered as early as the 1950's, and more sites continue to be discovered today in the Lingnan region, an area south of the Yangzi River valley (*Jiao 1990; Zhao 1997*). By the beginning of the 1990s, about 120 early Holocene sites had been discovered in this region (*Jiao 1992*), although the date and nature of many of these sites are still controversial (*An 1989; Fu 1998*). In recent years, the Institute of Archaeology at the Chinese Academy of Social Sciences, and local archaeologists from the Zhuang Automomous Region in Guangxi, have jointly excavated two shell-mound sites at Dingshishan and Baozitou, both near Nanning city, the capital of Guangxi. The excavations have yielded many new clues for the study of Early Neolithic culture in this region and in South China (*Fu et al. 1998*).

As early as in 1947, the material deposits found at Zalainuoer in Inner Mongolia, led Professor Pei Wenzhong to believe that these were remains of the Mesolithic era (*Pei 1947*). At the beginning of the 1970s, coarse ceramics associated with microlith cores, and the bones of humans and *Mommuthus primigenius Blumenbac* were found in the bottom of layer 4 at this site. This material was considered to be from one of the earliest Neolithic cultures in north-east China and North East Asia (*Shi 1978*). Since there is a large number of Neolithic sites dated between 7000 and 8000 BP, I believe that there may have been a long developmental process in Early Neolithic prior to this period in north-east China.

NORTHERN CHINA

Nanzhuangtou (Fig. 1a–b; 2a–b)

This site, about 10 km to the east of the Taihang Mountain and 21.4 m above sea level, is located on the western margin of the Huabei Plain. It consists of several stratigraphical components (*Baoding diqu wenguansuo et al. 1992; Li Jun 1998*). The lowest occupation has seven radiocarbon dates in a range between 9700 and 10 510 BP. This component contains stone artefacts including mortars, pestles, and a hammer, but without microliths or small chipped stone tools, which often occur at late Palaeolithic

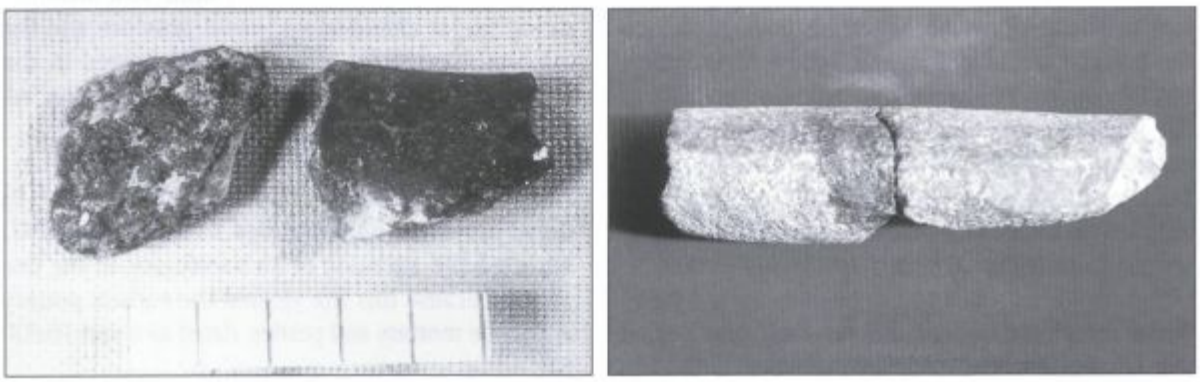

Fig. 1a–b. Left: Potsherds from the Nanzhangtou site (From the 1980's excavation at Nanzhuangtou site, Northern China. The ceramic is brittle and coarse, and represents the beginning of pottery-making in North China.) (After Baodingdiqu Wenguanhui etc. 1992.). Right: Stone pestle from the Nanzhuangtou site.

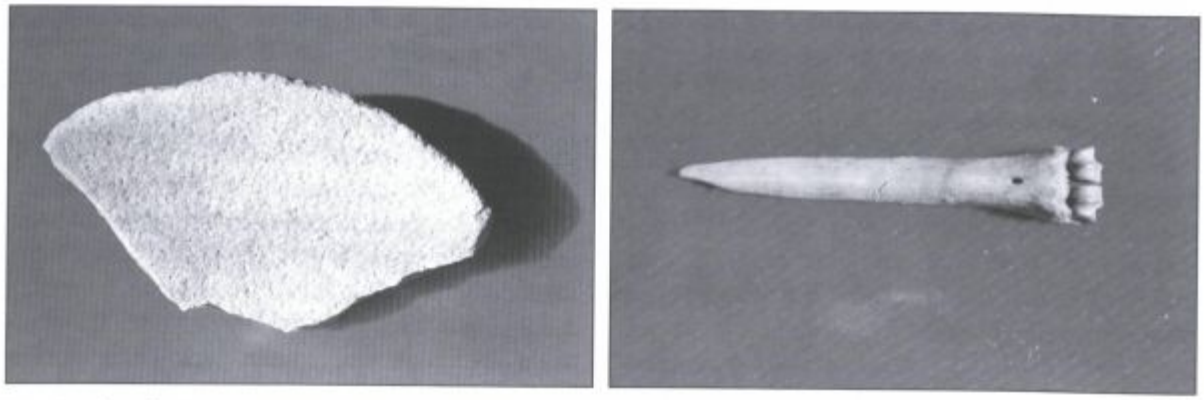

Fig. 2a–b. Left: Stone mortar from the Nanzhuangtou site. (No traces of farming exist, but the appearance of both pestle and mortar may indicate that food collecting is extremely important and initial agriculture is just under way.) (After Baodingdiqu Wenguanhui etc. 1992.) Right: Bone awl from the Nanzhuangtou site. (From the 1980's excavation. Bone and antler implements are very important in the Nanzhuangtou culture; this is further demonstrated by the 1990's excavation.) (After Baodingdiqu Wenguanhui etc. 1992.)

and Early Neolithic sites in both southern and northern China. Bone and antler tools, such as awls and arrowheads, were found. In addition, pottery sherds were discovered in the lowest level of deposits. An examination of the pottery by the excavators and myself suggests that the pottery-making technology was rather primitive.

The ceramic paste is coarse, tempered with quartz, biotite, sand, and shell. The texture is brittle and loose. The thickness is uneven, about 0.8–1.0 cm. The surface decoration is predominantly cord-marked, but also includes appliqué bands and picks, prick designs, and perforations. The pottery types are simple, flat-bottomed jars, usually with smudge traces on the outer surface. The manufacturing techniques are still unknown because of the small size of the sherds. Excavators (*Jin et al. 1992*) have identified no evidence for the slab-method. However, some kind of moulding or a paddle-and-anvil technique may have been used. No re-firing test has been carried out to determine the firing temperature. However, the presence of carbonised plant fibres on the inner surface, a greyish-brown colour of the past, and the impure surface, suggest a very low firing temperature.

YANGZI RIVER REGION

Shenxiandong

The cave site is located on the north-western slope of the Huifengshan hill and at an elevation of more than 80 m above sea level. The cave deposits can be divided into upper and lower components separated by a 10 cm limestone board. The cultural remains and animal fossils were found in the upper component. Two pottery sherds and the bones of *Crocuta ultima Matsumoto* and *Meles leucurus Hodgson* were found at the second level of this component (*Lishui Shenxinadong Team 1980; Li Yanxian et al. 1980*). The radiocarbon date of the layer points to 11 200 years ago and the appearance of *Crocuta ultima Matsumoto* of the late Pleistocene support the date, although more dating work is needed.

The two potsherds are very small, the largest being only 2.7 cm long, 1.8 cm wide, and 0.5 cm thick, so manufacturing techniques cannot yet be determined. The outer surface of the sherds is brown, while the inner surface is orange. The thickness is uneven, and some micro air holes can be seen in both the inner and outer surfaces. The ceramic paste is tempered with fine sand and plant fibre, which was carbonised. However, since only a small portion of the site was excavated, and no cultural material other than potsherds was found, the authenticity of this site and the potsherds has been challenged by some archaeologists (*An 1989; Deng 1986; Zuochuan 1984*).

Xianrendong (Fig. 3, 4) and Diaotonghuan

The Xianrendong site is located on the slope of a small hill in the north-east of Jiangxi province. With a river and flat land in front of the cave, the habitat is suitable for human habitation. Four excavations have been carried out since 1962, and the latest ones, in 1993 and 1995, conducted by a Sino-American team has yielded exciting results that have yet to be published (*Jiangxisheng wenguanhui 1963; Jiangxisheng bowuguan 1976; Liu 1996*).

The reporters of the first excavation realised that the site consisted of two cultural-chronological com-

ponents. The lower occupation was the Early Neolithic, and the upper one was the late Eneolithic. The researchers on the second excavation of 1964, however, believed that the both occupations belonged to the Early Neolithic. Although archaeologists had different opinions on the chronology of the deposits, they all agreed that the two occupations had chipped and polished stone tools and potsherds. The only difference is that the lower one had less polished stone tools with less variation in ceramics, while polished stone tools and various ceramics dominated the upper one. The last two excavations revealed four horizons; the third and fourth were thought to be the lower occupation, and the second was the upper occupation. The cultural remains of the two occupations are different because the lower one has only chipped stone tools, whereas the upper one has not only chipped and polished stone tools, but also potsherds. The lower occupation is considered to be of late Palaeolithic culture, while the upper is Early Neolithic. Since a report on the latest excavations has not yet been published, it is impossible to compare deposits yielded from different excavations. However, it seems that the upper occupation of the last two excavations can be further divided into different periods, which correlate to the lower occupations of the first two excavations. The radiocarbon dates of the upper occupation of 1993 and 1995 excavations are from 9000 to 14 000 BP, and thus have been regarded as the earliest Neolithic remains in China.

Diaotonghuan rock shelter site is about 800 m away from the Xianrendong site. It consists of the same cultural-chronological components as those of the Xianrendong site. It is thus considered the campsite of the residents living in Xianrendong.

The lower occupation of the 1960s excavations shares many characteristics with the upper occupation of the 1990s excavations. For example, polished stone tools appeared, and a large number of bone and shell tools were found. The pottery paste is primarily coarse, tempered with sand (mainly quartz), as large as 1.0 cm long and 0.5 cm wide. The walls of the sherds are uneven and thick. The texture is brittle and loose. The pottery shapes are simple, mainly round-bottomed jars, based on the reconstruction of large pieces of potsherd. It is difficult to distinguish body parts from rims. The colour is heterogeneous reddish and brown, resulting from inadequate control of the firing temperature. The pottery surface is unslipped and rough. In some cases, both the inner and outer surfaces are decorated with cord marks or basket-like impressions. I have thus hypothesised that some kind of moulding or a paddle-and- anvil technique was employed. A rounded stone, bamboo, basket, gourd, or melon may have been used as a mould, to which pieces of clay were then applied (*Chen Xingcan 1998; Wang 1995*). Some kinds of perforations were applied near rims; a similar feature has been identified in early ceramic assemblages in the Russian Far East and other parts of China (*Zhushchikhovskaya 1997; Chen Xingcan 1998*). I hypothesise that the perforation is evidence of a molding technique rather than a kind of decoration.

Pollen analysis and phytolith studies show that the incipient cultivation of wild rice should have been

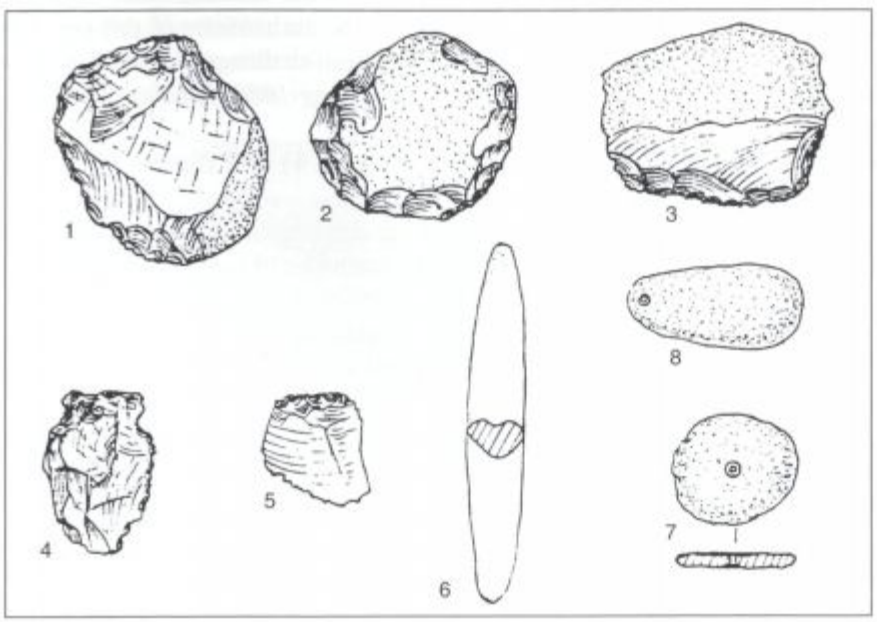

Fig. 3. Xianrendong. Early Neolithic stone tools and artefacts. (After Jiangxisheng Wenwu Guangli Weiyuanhui 1963; Jiangxisheng Bowuguan 1976.) M 1:2.

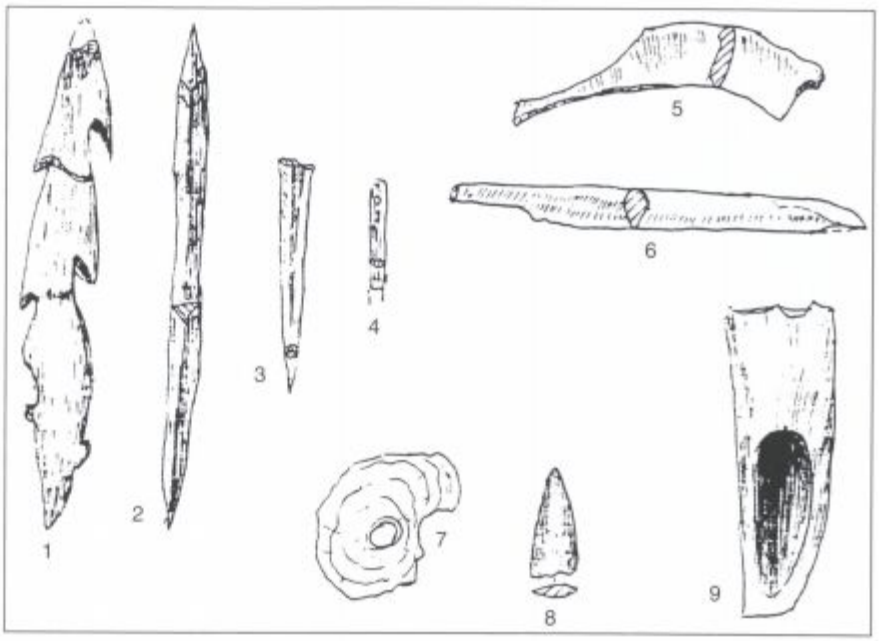

Fig. 4. Xianrendong. Early Neolithic bone tools. (After Jiangxisheng Wenwu Guangli Weiyuanhui 1963; Jiangxisheng Bowuguan 1976.) M 1:2.

practised during the upper occupation period. But more work on absolute dating is needed.

Yuchanyan

This cave site is located at Baishizhai village in Daoxian county, Hunan Province. It consists of cultural deposits of about 120 to 180 cm in depth, with a large number of artefacts such as tools made of stone, bone, antler, and shell. All stone tools are chipped, including cores, flakes, choppers, scrapers, knifes and hoe-like tools. The stone tools are very coarse, and few microliths were found (*Yuan 1996*).

The ceramic assemblages from this component are predominantly small fragments of body sherds. The ceramic paste is coarse, tempered with sand and plant fibre. The colour is brown, indicating that the firing temperature was low. The walls of the ceramics are as thick as 2 cm. However, the texture is very brittle because of the low firing temperature and non-plastic temper. In some potsherds, two or more layers can be observed on the cross section, and basket-like marks can be seen on both the inner and outer surfaces. These may be related to manufacturing techniques such as molding. An experimental study in making ceramic vessels on a hard mold has shown that small pieces or disks of clay can be applied to the mold in order to form a vessel (*Zhushchikhovskaya 1997; Yu 1987*).

No radiocarbon dates of this component have been published, but a similar site nearby has been dated to 12 060 ± 120 BP Thus it is believed that the Yuchanyan component is about 10 000 BP (*Yuan 1996*). One of the most important findings at this site is the discovery of rice husks and rice phytoliths. Studies indicate that rice began to be cultivated there. Therefore, the rice remains discovered at Yuchanyan represent the earliest evidence of rice cultivation in China and in the world. However, more dating work must be done before we make any further inferences.

LINGNAN REGION

Dingshishan (Fig. 5a–b)

This site is a shell mound site, located on the first terrace of the Bachijiang river in the east of Nanning city, Zhuang autonomous region, Guangxi province. It consists of several cultural-chronological components (*Fu 1998; Fu et al. 1997*). The lowest occupation is under a layer containing shells and is about 20 to 30 cm thick. This component contains stone artefacts of a small flake tool tradition, which is characterised by micro cores and flakes only about 1–1.5 cm long, directly purchased from silicic volcanic cobbles. Only a few pieces of ceramic vessels were discovered, and there is no distinction between body and rim parts. The shape is simple, with a round bottom. The walls of the pottery are thick and the texture is brittle. The outer surface is decorated with cord marks, and in some cases, the rims were decorated with appliqué bands. The ceramic paste is tempered with sand. The size of the sand is uneven, and the distribution of grains in the paste is irregular.

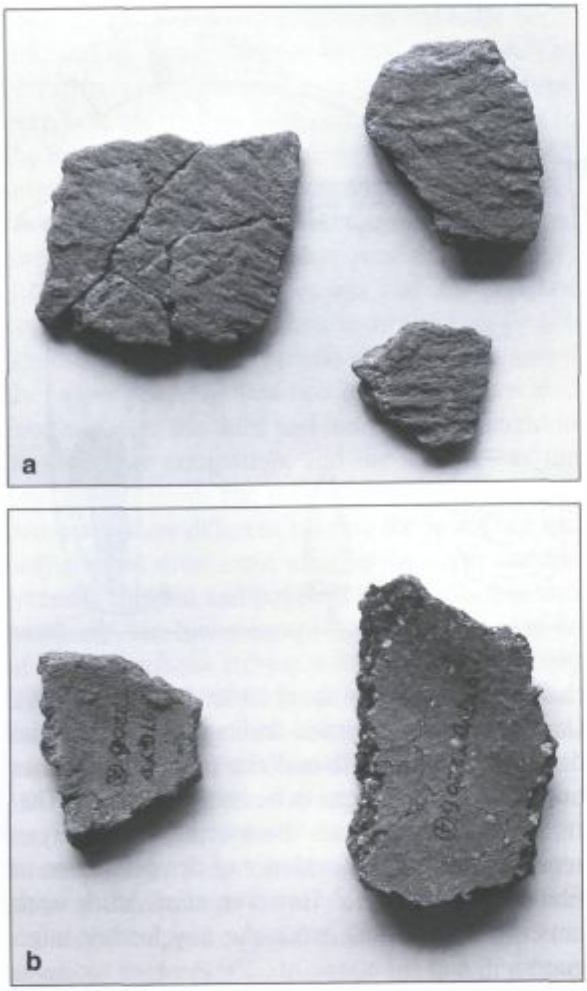

Fig. 5. a: Potsherds of Dingshishan site (front view). b: Potsherds of Dingshishan site (back view). From the first period of Dingshishan site, south China, about 10 000 BP. Extremely coarse sand can be seen from both exterior and interior faces. (After Fu 1998.)

This component is considered one of the earliest Neolithic remains in the Lingnan region (*Fu 1998*). No radiocarbon dates for the component are available, but the upper level of occupation is dated to 10 365 ± 113 BP Taking into account the error in radiocarbon dating caused by limestone environment there, it is believed that the upper level of occupation is about 7000–8000 BP. Typological studies of ceramics support this hypothesis. Therefore, the component in concern should be dated about 10 000 BP (*Fu 1998*). However, more work on the dating of the component still needs to be done before we make any further inferences.

Liyuzhui

The site is located in the southern suburb of Liuzhou city, in the Zhuang autonomous region, Guangxi Province. It consists of two cultural-chronological components (*Liuzhoushi bowuguan et al. 1983*). The lower component consists of shell deposits as thick as 100 to 170 cm, containing both chipped and polished stone tools and ceramic fragments. The chipped stone artefacts are come from two traditions: chopper-chopping tools and small, chert flake tools. Axes and discs with a hole in the centre dominate the polished stone tools. But the chipped stone tools make up the majority of the stone artefacts. Only eight pieces of potsherd have been discovered. Among them, seven are tempered with sand and one is of fine clay. Thickness varies from 0.2 to 0.8 cm. The surface is red or black, decorated with coarse cord marks. The shapes of the vessels, although they cannot yet be reconstructed accurately, are probably as simple as those from the other sites: jars with round bottoms and no clear distinction between the body and rim parts.

Two radiocarbon dates are available for this component: the shell sample is 23 330 ± 250 BP (BK 82091), but the human bone sample at the upper level of the occupation is 11 785 ± 150 BP (PV-0402). These dates contradict two other dates of 12 880 ± 220 BP (BK 82090) and 7860 ± 100 BP (PV-0378) obtained from the upper level of components. In spite of errors in dating, it seems that the upper and lower occupations may have been accumulated over a long period, and the lower one may have contained the Early Neolithic remains. Comparative studies on ceramics and lithics also indicate the existence of the Early Neolithic culture.

Zhuwuyan

This cave site is located on the eastern slope of a small hill, with a main chamber facing to the east and two side chambers extending to the west and south (*Guangdongsheng Bowuguan 1961*). The investigation and test excavation yielded many materials, such as shells, burnt bones, ash, choppers, and, most important, a piece of potsherd. The potsherd is sandy ware, with coarse cord marks.

Several similar cave sites have also been discovered nearby. Some of them contained ceramic remains, which are usually considered as the same assemblage as the example from the Zhuwuyan site. A re-collecting sample from the Zhuwuyan site has a radiocarbon date of 17 140 ± 260 BP (BK) (*Chen Tiemei 1988*). This date is far from reliable. However, the artefacts support the hypothesis that the component is of Early Neolithic cultural remains.

NORTH-EASTERN CHINA

Zhalainuoer

This site is located at an open coalmine near Mangzhouli city, Inner Mongolia. Human and animal bones and cultural remains have been found several times since the 1930s. In 1974, geologists made an observation on a section at the northern part of the minefield, and divided a Quaternary occupation of 12.9 m into six layers. Three human skulls and a number of artefacts were discovered from the fourth layer (*Shi 1978*). The material component contains stone artefacts characterised as from the microlithic tradition, including arrowheads, end scrapers with convex edges, microcores, and microbaldes. In addition, notched bone knives, bone awls and a piece of polished bone scapular blade, fragments of ceramic vessels, including undecorated and cord-marked ones were found in the same context. All pottery sherds are tempered with sand, and unslipped and rough.

There was no carbon 14 dates for the component prior to the 1980s investigation. A date of 11 460 ± 230 BP (PV-15) obtained from the upper part of the fifth layer indicates that the component was about 10 000 BP, which belongs to the early Holocene (*Shi 1978*). But some archaeologists doubt the reliability of the date, since the sample was not from the fourth layer (*An 1983*). In 1980, another investigation was carried out and the results supported the first investigation. That is, the component belongs to the early Holocene (*Li Xingguo et al. 1991*). However, two radiocarbon dates of 11 660 ± 130 BP (PV-171, wood sample) and 7070 ± 200 BP (PV-106, shell sample) from the upper parts of the fifth and the fourth layers make the situation more complicated. Geologists believe that there is a bed between the fifth and sixth layers, which respectively corresponds to the Pleistocene/Holocene transition. So, it is believed that it is proper to date the component to about 10 000 BP, even though the fourth layer was considered as a lacustrine sedimentation rather than a residential area of human occupation (*You 1984*). Since formal reports have not been published yet, any inference is debatable. However, the microlithic tradition may support the above conclusion. Also, the early ceramics assemblage between 8000 and 13 000 BP from the Russian Far East and Japan hint the possible existence of the Early Neolithic culture with incipient pottery making.

I believe that the eight sites discussed above are the earliest Neolithic cultural remains with incipient ceramic assemblages. The Peiligang culture in the middle Yellow River valley, the Houli culture of the lower Yellow River valley and the Pengtoushan culture in the middle Yangzi River valley all revealed ceramic remains dated to as early as 8500 BP (*Henansheng wenwu yanjiusuo 1998; Shandong sheng wenwu kaogu yanjiusuo 1998; He 1996*). If we place all the cultural remains prior to 8000 BP in Early Neolithic culture, these sites should be included in this discussion. But all of them developed advanced sedentary villages and practised agriculture, therefore they are excluded here.

DISCUSSION

The earliest Neolithic sites in China, six of them are cave or shelter, and three are identified as open-air sites share many common features. For example, they are characterised by the same subsistence strategy of hunting, fishing and gathering, rather than farming, although in some cases incipient rice cultivation may have been employed (Yuchayan). The occurrence of polished stone mortars and pestles (Nanzhuangtou) may indicate the processing of grains, but no cultivated millets or other crops were found in the deposits. These tools, therefore, may have been used to process wild plants rather than domesticated ones. Stone mortars were also discovered at the terminal Palaeolithic site, Xiachuan, which is located not far away from Nanzhuangtou. They are considered as tools for processing wild plants. At a few sites, knives made of shells were used as cutting tools. These shell knives, along with a large quantity of mollusc and fish remains, show that fishing may have played an important role in the daily life of these prehistoric people. Only two kinds of animal found at the Nanzhuangtou site, pig and dog, may have been domesticated but identification is still problematic (*Baoding diqu wenguansuo 1992*).

Various stone tool traditions developed in different regions, but the stone artefacts are characterised by a combination of Palaeolithic and Neolithic technologies. In the cave sites in southern China, chipped tools dominated the lithic assemblages. In some cases, a chopper-chopping tool tradition occurred (Zhuwuyan, Liyuzhui); while in other cases a small flake tradition (Yuchanyan and Xianrendong) dominated the tool kit. In one case at the Dingshishan site, a microlithic-like tradition existed. Fauna analysis shows that there were no extinct species of the Pleistocene in those assemblages, except for the Shenxiandong assemblage with the finding of *Crocuta ultima Matsumoto.*

Early ceramic assemblages from the different regions in China are characterised by certain technological and morphological features. Almost all-ceramic pastes are very coarse, and tempered with non-plastic material (mainly quartz, and in some cases plant fibre). The size and distribution of the sand grains in the paste are irregular; indicating that natural clay may have been used, without artificially processing the temper (*Zhushchiknovskaya 1997*). However, a stack of artificially tempered clay with very coarse quartz grains was discovered at the Baozitou site near Dingshishan, dating to a period later than the lowest occupation of the Dingshishan site (*Fu 1998*). This may suggest that even incipient ceramic pastes were artificially processed rather than directly obtained from natural sources.

All ceramic vessels were hand-made, but not all assemblages provide evidence of manufacturing techniques. In most cases, a molding technique, perhaps in conjunction with the use of a paddle and anvil, may have been employed. This hypothesis is supported by the fact that cord or basket-like marks are found on both inner and outer surfaces, and that two or more layers of clay can be observed on the cross sections of some vessel walls. Small pieces or discs of clay may have been pasted on a stone, basket, or even a guard to form a vessel in the initial manufacture. The coiling method, mainly used in the middle and late Neolithic periods in China, has not been found in these early assemblages. This is different from that of the early assemblages of the Far East region in Russia, where a coiling technique was employed in the early pottery-making period. The use of molds in the manufacturing process was popular in several areas of Eurasia (*Borrinsky 1978*), especially in East Asia (*Zhushchikhovskaya 1997; Wang 1995; Yu 1987; Chen Xingcan 1998*).

Most ceramic vessels are decorated with cord marks; only a few are plain. Appliqué bands and /or perforations are often employed on the rim. These features are similar to those of early ceramics from other regions of eastern Asia and other areas in the world (*Vandiver 1991; Zhushchikhovskaya 1997*). The appearance of perforations may indicate the application of a molding method. The absence of surface treatments, such as rubbing, smoothing, and slipping, is typical of these early assemblages.

The ceramic shapes are simple. In most cases, there is no distinction between body and rim parts. The bases of almost all vessels found in southern China, whenever identifiable, are rounded (Xianrendong, Dingshishan). But, a flat base seems to dominate pottery design in north China (Nanzhuangtou). These features later became distinctive traditions characterising southern and northern Neolithic ceramic assemblages in China. For example, most vessels from the Xinglouwa culture in Inner Mongolia which have been dated to 7000 to 8000 BP are flat-bottomed, while the Pentoushan culture of the middle Yangzi River valley has yielded more round-bottomed vessels. The different traditions may occur as early as the onset of the pottery-making period. The differences may reflect that different molds were used for ceramic production then. The prehistoric people of the South may have used round-bottomed objects such as basket or guard as molds, while people in the North may have used flat-bottomed objects such as wooden containers as molds.

In the Early Neolithic cultures, a reddish-brown or greyish-black coarse ware with sandy or plant fibre temper made up the major portion of pottery assemblages. The walls of the sherds are uneven and thick. The ceramic samples are very brittle and loose. In most cases, the sherds are very small, so it is difficult to study and to reconstruct manufacturing techniques. The firing temperature must have been very low because of the brittle texture and heterogeneous colour. However, re-firing tests have not been carried out in most cases, and no kilns have been found at those early sites. It is reasonable to infer that the incipient pottery may have been burned in open-firing sites rather than in kilns.

These eight sites consist of ceramic assemblages that represent a similar level of pottery manufacture, and are dated to a fairly large temporal interval between 14 000 and 9000 BP. This large interval may be affected by the small number of radiocarbon dates available for these assemblages, and by the lack of more efficient absolute dating methods. However, any progress in Early Neolithic studies should be based on fieldwork rather than on carbon 14 dating itself. The contradictory absolute dates may have been caused by fieldwork rather laboratory errors.

Since the pottery dated to about 10 000 BP was found in the 1950s in the Japanese archipelago, East Asia has been considered as one of the locations to search for the origins of ceramics by a increasing number of archaeologists in the world (*Deng 1985*). As early as 8000 BP, various ceramic traditions had been established in China, indicating that there must have been a long process of development in each of those traditions prior to this period. Archaeological

discoveries support this hypothesis. The new evidence not only places the origins of pottery to a period 1000 years earlier than we thought before, but also changes our understanding of the Early Neolithic cultures.

There are two questions arising from these new data. First, did the invention of ceramics appear with subsistence based on agriculture? It seems that the early pottery vessels were made by people who depended on food foraging rather than on food production. Although rice cultivation may have started in some areas (Diaotonghua and Xianrendong), hunting, fishing, and gathering still dominated the economy. In most areas of Lingnan and north-east China, agriculture did not begin until the late Neolithic or even the Bronze Age. In contrast, the peoples in West Asia and Southeast Europe had lived in sedentary villages and practised agriculture for 1000 years or more before making pottery (*Singh 1974*). The second question is, did China experience Pre-Pottery Neolithic cultures? The concept of a pre-pottery Neolithic that refers to the appearance of agriculture signifies the beginning of the Neolithic Age. But agriculture did not occur in most of the early Holocene sites, regardless of the presence of ceramics. It seems that the idea of a Pre-Pottery Neolithic, which is widely used in the Western literature, may not be apt for Early Neolithic cultures in China.

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