

The Dating of Chinese Early Pottery and a Discussion of Some Related Problems¹

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ABSTRACT - *This paper examines the radiocarbon dating of Chinese early pottery. It is suggesting that the earliest pottery in eastern Asia can be dated to 17 000 years BP, in the period of the last Pleistocene glaciations in Eurasia.*

IZVLEČEK - *V članku raziskujemo radiokarbonske datacije zgodnje kitajske keramike. Menimo, da lahko najzgodnejšo keramiko v vzhodni Aziji datiramo v čas 17 000 BP, to je v obdobje zadnje pleistocenske poledenitve Evrazije.*

KEY WORDS - *China; Palaeolithic; Neolithic; pottery; AMS radiocarbon dating*

INTRODUCTION

The invention of pottery is a milestone in the history of human civilization. The uses of pottery made a great improvement in the conditions of ancient human life and increased the adaptability of humanity to nature. Therefore, prehistorians and archaeologists always pay great attention to the discoveries of early pottery. Some archaeologists consider the appearance of pottery as a boundary between the Palaeolithic and Neolithic. Sites of early pottery have been unearthed in Japan, Russia, Mongolia, China and elsewhere in Asia since the corded pottery with an age greater than 10 thousand years was excavated at the Fukui Cave site in Japan in the 1960's. The early pottery found in different sites in China gave earlier radiocarbon ages than those in other countries and attracted the particular attention of academia. This article gives a brief introduction to the discoveries and dating of Chinese early pottery and discusses some related problems.

DISCOVERIES OF CHINESE EARLY POTTERY

Many sites of early pottery have been excavated in China successively since Xianrendong site was unearthed at Wannian County in Guangxi Province in

the 1960's (Fig. 1 and Tab. 1). All this pottery proved to be older than 10 thousand years according to different dating measurements. The sites of Zengpiyan, Liyuzui, Miaoyan, Yuchanyan, Xianrendong, Diaotonghuan, Nanzhuangtou and Yujiagou have very clear stratigraphical and periodical sequences. The early pottery discovered on Yuchanyan, Miaoyan, Xianrendong and Diaotonghuan sites have the same technological characteristics of those found in South China. Nanzhuangtou and Yujiagou pottery represent the typical styles of North Chinese pottery production.

The cave site of Yuchanyan, also called Toad Cave, is located in Baishizhai village in Dao Xian, at the north side of Nanling Mountain, in the Southwest of Hunan Province. This cave is 5 meters high above the modern surface and faces southeast, with a capacious hall at the entrance of the cave, which admits much sunlight. There is an open plain in front of the cave. The site was excavated twice, in 1993 and 1995, over an area of some 100 m² and to a depth of 1, 2 to 1, 8 metres. The cultural continuity from Palaeolithic to Neolithic has been determined. The artefact assemblages consist of (a) stone tools - scrapers, cutters, points, etc., (b) bone tools - chip-

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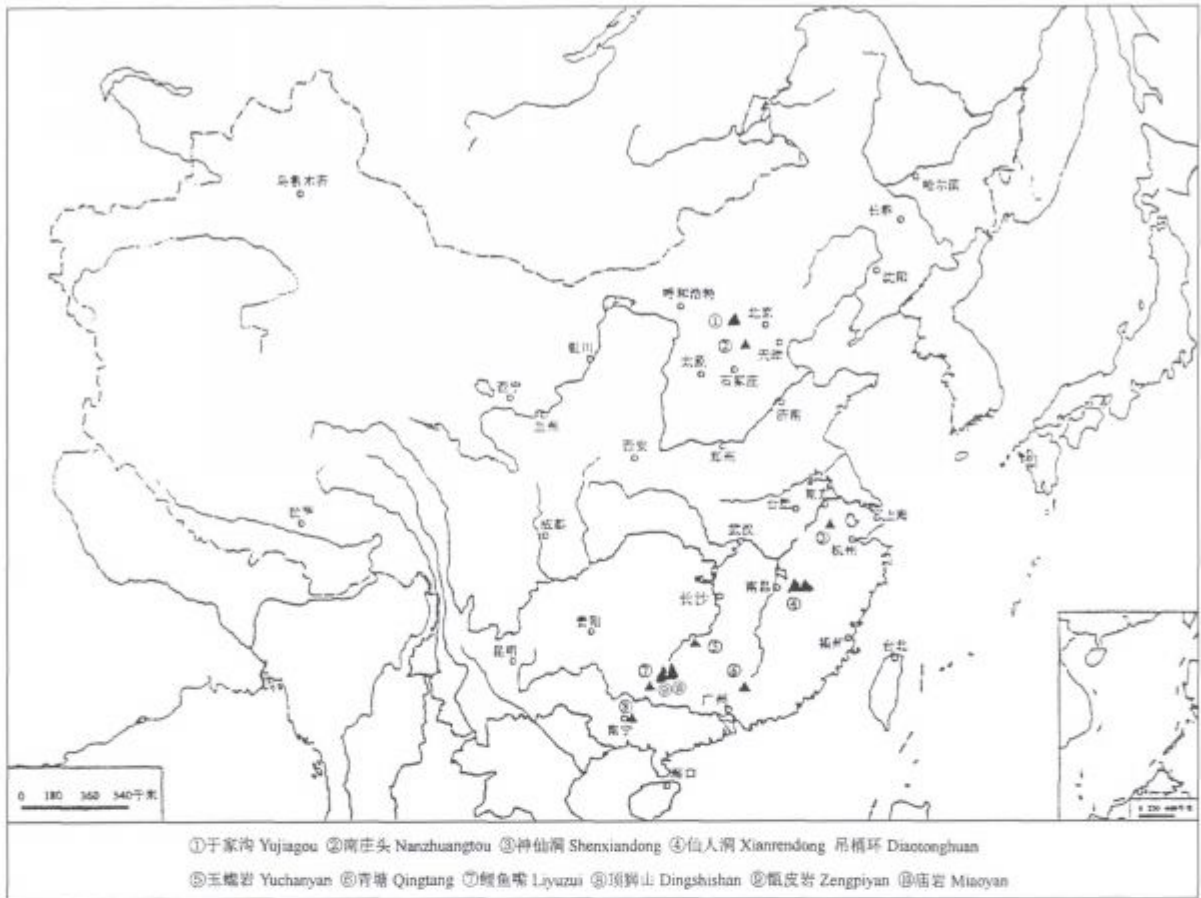


Fig. 1. The distribution of the sites of early pottery in China.

ped horn shovels, polished bone shovels and awls, (c) perforated shells and notched teeth. Traces of burning have been detected on the artefacts. However, the most important discoveries in Yuchanyan site are early pottery - coarse sandy wares, dark brown in colour and rice husks. The largest inclusion was identified as sandy grain, about 2 cm in diameter. The pottery discovered in 1995 was restored as a wide-mouth cauldron with pointed round bottom. Decoration consists of a corded pattern in a rough texture inside and outside of vessels. Four grains of rice were collected in 1995 being identified as a domestic species with the character of a wild species. Abundant rice phytoliths were also recovered from the soils of the cultural deposit, accompanied by a large quantity of animal and plant fossils, including 28 species of mammal, 27 birds, 5 fishes, 33 kinds of shells, terrapins, insects and so on, and more than 17 species of plant (Yuan 1996).

Xianrendong and the Diaotonghuan are two cave sites, 800 metres distant from each other. They are located in Dayuan Xiang Village in Wannian Xian County, in northern Jiangxi Province. They are situated within a small, swampy Dayuan basin. The Xian-

rendong cave faces southeast. A small river flows from east to west in front of the cave. Four excavations were carried out, in 1960, 1964, 1993 and 1995. The Diaotonghuan cave is situated at the top of a small limestone hill about 60 metres high. A full-scale excavation was carried out in 1995. Both of the sites have abundant cultural deposits, belonging to the period of the Late Palaeolithic to the Early Neolithic. A considerable quantity of archaeological remains were discovered at the two sites in 1995, including 625 stone objects, 318 bone artefacts, 26 perforated shells, 516 pottery fragments, thousands of animal and a number of human bones. The stone tool assemblage consists of scrapers, points, choppers, multi-edge blades and micro-blades made from flint and quartz chips. Bone and antler tools comprised spades, awls, needles, arrowheads and fish darts. The pottery fragments were fired at low temperature, with brown coloration. Large grains of feldspar and quartz mark the fabrics. The basic shape looks like a cylinder jar with round bottom and upright mouth or something like a round-bottomed vessel with swelling belly and slightly wide flared mouth. Both the inside and outside of the vessel are decorated with stripes in a basket pattern. Most of

the animal bones from these sites belong to deer, making up 80% of the assemblage, followed by pig and fowl (including chicken) bones. The analysis of pollen and phytoliths give evidence of the existence of wild rice and cultivated rice at both sites (*Zhang and Liu 1996*).

At Diaotonghuan site the prospecting trench at a depth of 5 metres was divided into 16 stratigraphic zones, from zone A to zone P (*MacNeish and Libby 1995*). Table 1 provides the representative cultural remains for the six upper zones (*Zhao 1997 (1998)*).

Zones	Representative Cultural Remains
B	Pottery with geometric impressions. Predominance of ground stone tools.
C	Early pottery made by the coiling method.
D	Early pottery made by the section modelling technique.
E	Primitive ceramics.
F	Ground stone tools. But chipped stone tools and bone artefacts are dominant, which continues through Zone C.
G	Chipped stone tools and bone artefacts.

Tab. 1. Cultural remains for the six upper zones of Diaotonghuan site.

The Miaoyan cave is located on a small limestone hill, situated in an eastern suburb in Guilin, in Guangxi province. This cave is about 150 metres above sea level and 13 metres above the ground. An archaeological team from Guilin carried out an excavation in 1988. An area of 50 square metres was excavated in the cave. A total of 6 well-defined stratigraphic zones were identified in a 2.4–2.9 meters thick cultural deposit, which covered the remains of the transitional period from the Palaeolithic to the Neolithic. There were abundant stone and bone tool assemblages deposited. The early pottery was documented in the layer 5. There were five undecorated fragments in grey and brown colour deposited. Some of them had soot on the surface and quartz and carbon granules mixed in the clay matrix.

Nanzhuangtou site was found in Xushui County, Hebei Province, located at the eastern foot of Mount Taihangshan, on the western edge of Northern China fluvial plain, at an altitude of 214 metres (*Baoding Institute of Cultural Relics 1992*). It is an Early Neolithic site covering the area of 300 square metres. The site was excavated in 1986 and 1997. Besides ash pits and fire evidence, certain cultural remains,

such as a grinding stone and saddle-querns, bone awl, bone arrow, antler-awl, perforated crabstick, and wood pieces were found. There were also identified large quantities of animal and bird bones, snail and clamshells, foliage, seeds etc. Sand and mica have been identified as main inclusions in 20 pottery fragments. The bodies are about 0.8–1 cm thick. They were made at low temperature with a loose texture. Most of them are grey, and a few are red and brown. Most of them are jars with flat bottoms on which we can see the evidence of firing and smoking, and some look like little bowls (*Li 1998*).

Yujiagou Site was found in Hutouliang County, Hebei Province, located on a northern branch of Sanggan River. From 1995 to 1997 the Department of Archaeology at Beijing University carried out excavations at this site in cooperation with the Institute of Cultural Relics in Hebei Province. We found overlapping cultural layers from the Late Palaeolithic to the Early and Middle Neolithic within the 7 metres of deposit. There were plenty of stone tools, such as scrapes, points, arrows and very many microliths. Pottery and bone tools were also found, accompanied by a large quantity of animal bones. The pottery was found in a grey and yellow-silver sand layer 3. The fragments are sandy ware, of red and brown colour, among which the largest piece seems to be the bottom of a flat object (*Institute of Cultural Relics in Hebei Province 1998; Zhou 1999*).

DATING OF CHINESE EARLY POTTERY

The dating of potsherds and related archaeological strata has been completed at the Laboratory of Archaeometry and Conservation at Beijing University and the Laboratory in the Institute of Archaeology at the Academy of Social Sciences. These potsherds were excavated at sites in Yuchanyan, Miaoyan, Xianrendong, Diaotonghuan, Nanzhuangtou and Yujiagou, and others. The results of series dates are list in Tables 2, 3, 4, 5, and 6.

The dating samples were collected from different layers at different sites and different kinds of samples were treated with different pre-treatment methods. For example, we used sherds to date directly the sites at Yuchanyan and Miaoyan. At first, we analysed carbon sources in the pottery and followed different procedures to collect different carbon components. For the pre-treatment procedures see Figure 2. The components of humic acid and residue were dated and the results of these dates agreed with the

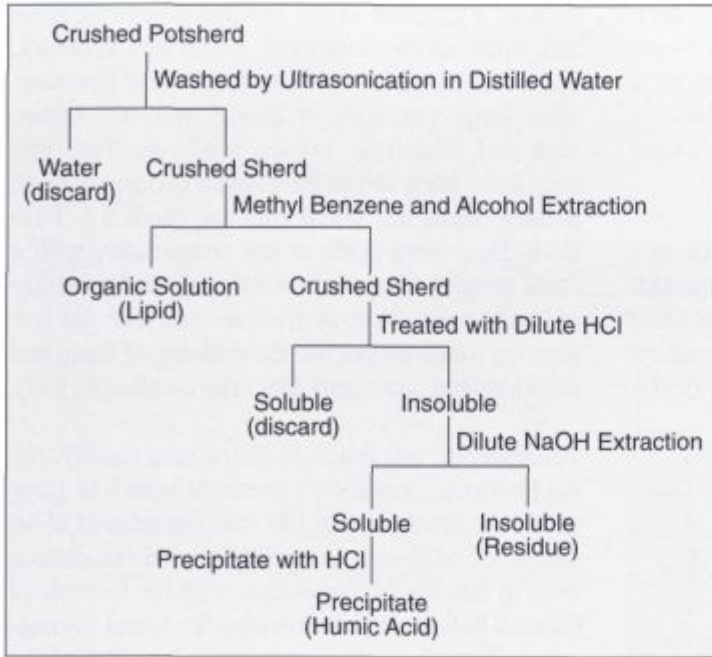


Fig. 2. Pre-treatment procedure of potsherd for radiocarbon dating.

dates of different kinds of samples from the same layers. See tables 2 and 3.

All of the radiocarbon dates younger than 20 thousands years in this article were calibrated by OxCal v 3.5 with intcal 98. The calibrated age of the earliest Chinese pottery is about 17 thousands years BP. So far, potsherds older than 10 thousand years have been found at many sites in different countries in East Asia, such as China, Japan and Russia (Tab. 6). This fact gives us very important information for research on the origin of pottery in the world and the relationship between human activity and the environment in the late Pleistocene.

DISCUSSION ON SOME RELATED PROBLEMS

One of the important questions for discussion in the field of prehistoric historiography and archaeology

is the origin of pottery. Until now, there have been many academic viewpoints. One is that the primitive people invented the basket container by spreading some earth and wattle from all kinds of foliage on it. By accident, the wattles were burned and a basket made of clay is left. That was the invention of pottery. The other standpoint is that the pottery is going with the origin of agriculture. Agriculture has close relations with residential settlement. Only settled residents have the need to use pottery. The appearance of pottery in western Asia happened after the invention of agriculture. From Chinese ancient literature we can also read "Shennong people invented agriculture earlier than pottery" (Song et al. 1983). Other scholars have stated firmly that the invention of pottery was not related to agriculture (Clark 1952), because in some areas pottery appeared

before agriculture and some peasants did not use pottery (Child 1956). We believe that pottery is something that is closely related to people's daily life. And the clay used to made pottery can be found here and there. At present, pottery dating earlier than 10 000 years BP can be found not only in China, Japan and Russian, but also in western Asia and Africa. All this evidence proves that the invention of pottery did not happen in a single place. Regarding the primitive resident's use of early pottery, it is used not only by primitive peasants such as those living in western Asia, but also by people taking up collecting and hunting such as the early inhabitants of Japan in "a cord pattern cultural Age". This indicates that the invention of pottery as related to agriculture is not absolutely sure. Judging from the study of the early pottery found in China and Japan, the primitive people who invented the earliest pottery were still engaged in an economy of gathering and hunting. From the pottery excavated at the site of Yuchanyan,

Lab. No.	Zone	Material	Method	¹⁴ C Age (BP)		Calibrated Age (BC)	Remains
				5730	5568		
BA95058	3E	Charcoal	AMS- ¹⁴ C	14080±270	13680±270	15350-14500	Potsherds, Grains of Rice
BA95057a	3H	Humic Acid from Potsherds	AMS- ¹⁴ C	12320±120	11970±120	13150(0.45)12650 12500(0.55)12100	Potsherds
BA95057b	3H	Potsherds Residue	AMS- ¹⁴ C	14810±230	14390±230	16150-15400	Potsherds

Tab. 2. Radiocarbon Dating at the site of Yuchanyan at Dao Country in Hunan Province.

Lab. No.	Zone	Material	Method	¹⁴ C Age (BP)		Calibrated Age (BC)	Remains
				5730	5568		
BA92030-1	2	Shell	AMS- ¹⁴ C	12730±370	12370±370	13800–12300	
BA92033-1	3M	Shell	AMS- ¹⁴ C	12630±450	12270±450	13700–12200	
BA92034-1	4M	Shell	AMS- ¹⁴ C	13710±270	13320±270	14950–14100	
BA92036-1	5L	Shell	AMS- ¹⁴ C	18140±320	17630±320	20150–19100	Three Potsherds from 5M
BA92037-1	6L	Shell	AMS- ¹⁴ C	20920±430	20330±430	Out of Range	
BA94137a	5	Humic Acid from Potsherd	AMS- ¹⁴ C	15560±500	15120±500	17300–15900	Potsherds
BA94137b	5	Potsherd Residue	AMS- ¹⁴ C	15660±260	15220±260	17200–16300	Potsherds
ZK-2839	Right 2	Shell	¹⁴ C	12707±155	12350±155	13700–13100	
ZK-2840	Left 2	Shell	¹⁴ C	13547±168	13170±168	14650–14000	
ZK-2841	5	Shell	¹⁴ C	17238±237	16750±237	19000–18100	Three potsherds from 5M

Tab. 3. Radiocarbon Dating at the Site of Miaoyan at Guilin in Guangxi Province.

Xianrendong, Diaotonghuan, Miaoyan, Liyuzhui (*Liu-zhou City Museum 1993*), Zengpiyan, Yujiagou and some other places, we can conclude that the early pottery was made by mixing some irregular quartz and granule of feldspar or dolomite. There is soot on the surface of some pottery. Whether their bottoms are round or flat, they were used for cooking, called *guan* or *fu*. Although we do not have enough evi-

dence to prove what kind of things the cooked food were, we still can conclude that one of the main uses for this early pottery was cooking rice (in Northern China people collected *millet* and *proso*) from the evidences of rice phytoliths and grains of early cultivated rice found at Yuchanyan, Xianrendong and Diaotonghuan (*Zhang, Yuan 1998; Zhao 1997 (1998)*).

Lab. No.	Zone	Material	Method	¹⁴ C Age (BP)		Calibrated Age (BC)	Remains
				5730	5568		
BK86120	T ₁ ⑤-⑥	Wood	¹⁴ C	9875±160	9600±160	9750–9150	Potsherds, Stone Tools & Bone Tools
BK86121	T ₁ ⑤-⑥	Wood	¹⁴ C	9690±95	9420±95	9250(0.56)9110 9000(0.33)8890 8880(0.11)8830	Potsherds, Stone Tools & Bone Tools
BK87093	T ₁ ⑤-⑥	Wood	¹⁴ C	9810±100	9530±100	9600(0.04)9560 9390(0.96)9140	Potsherds, Stone Tools & Bone Tools
BK89064	1m East of T ₁ ⑤-⑥	Wood	¹⁴ C	9850±90	9570±90	9600(0.07)9560 9390(0.93)9210	Potsherds, Stone Tools & Bone Tools
BK87086	On Middle of North Wall in T ₃ ⑤	Mire	¹⁴ C	9980±100	9700±100	9690(0.04)9660 9630(0.96)9280	Potsherds, Flakes & Charcoal
BK87075	Bottom of T ₁ ⑥ Ash Pit	Charcoal	¹⁴ C	10510±110	10210±110	10900(0.96)10350 10300(0.04)10200	Potsherds, Antlers etc.
BK87088	Bottom of T ₁ ⑥	Mire	¹⁴ C	10815±140	10510±140	11070(0.75)10840 10800(0.25)10690	Potsherds, Stone Tools & Bone Tools

Tab. 4. Radiocarbon Dating at Nanzhuangtou at Xushui County in Hebei Province.

Zone	Sample No.	Depth (m)	Soil Type	TL Age (KaBp)
Top of Layer 2	Y-2-80	0.82	Grey-black Clay	2.13
Bottom of Layer 2	Y-2-16	2.08	Grey-black Clay	6.07
Top of Layer 3a	Y-3a-54	2.60	Brown-yellow Fine Silt	6.95
Top of Layer 3b	Y-3b-23	4.28	Brown-yellow Pulps	11.12
Top of Layer 6	Y-6-42	5.60	Grey-green Calcareous Silt	12.19

* The potsherds of early pottery were discovered at the top of forth layer. TL age of potsherd is 11.60KaBp.

Tab. 5. Ages of TL at the Site of Yujagou at Yangyuan County in Hebei Province (Zhengkai 2001).

At the above sites, where we found rice phytoliths and paddy remains, a large quantity of snail and clamshells were excavated. According to the quantity statistics, at Yuchanyan the categories of snail and clam totalled 33 (Yuan 1999). Also, we found the same instances at the site of Zengpiyan, Liyuzhui and Huangyandong and some other cave sites. The appearance of a large quantity of snails can prove that cooking rammish and fresh aquatic foods such as snail, clam and fish, is one usage of early pottery. Eating the rammish aquatic food is acceptable for people living near the sea, but it absolutely cannot

be accepted for people living inland. However, it is reasonable to imagine that this pottery was used for cooking. Some scholars have pointed out that, "In Southern China the early food which needed to be cooked is not wild rice, plant seeds or roots, but aquatic food which is rammish and cannot be eaten without cooking such as snail and clam" (Zhou 1994). This opinion is not absolutely correct,

but the appearance of early pottery going with large quantity of snails and clams in southern China can certainly provide us new clues for our discussion on the origin of pottery in this region.

The appearance of early pottery provided us new clues for our discussion on the relations between humans and living conditions in the Late Pleistocene. However, it was quite a normal opinion among academics that pottery was invented with the origin of agriculture and stockbreeding in Eurasia in the warmer Holocene (Pei and An 1986). So far, the earli-

Lab. No.	Zone	Material	Method	¹⁴ C Age (BP)		Calibrated Age (BC)	Remains
AA-13393	Gasya, Lower layer, Upper part	Charcoal	¹⁴ C	11 190±90	10 875±90	11 400(0.26)11 300 11 260(0.74)11 050	
LE-1781	Gasya, Lower layer, Bottom	Charcoal	¹⁴ C	13 340±120	12 960±120	14 400-13 750	Potsherds, 1.2-1.7 cm thick
AA-13392	Khummi, Lower layer, Lower part	Charcoal	¹⁴ C	13 650±100	13 260±100	14 700-14 150	
AA-13391	Khummi, Lower layer, Middle part	Charcoal	¹⁴ C	10 650±110	10 345±110	10 940(0.77)10 670 10 530(0.23)10 430	
GaK-949	3 rd layer in Fukui Cave at Nagasaki in Japan	Charcoal	¹⁴ C	12 760±350	12 400±350	13 900(0.57)13 100 12 900(0.43)12 300	Cordoned Pottery
	See above	Charcoal	¹⁴ C	13 070±500	12 700±500	14 500(0.83)13 100 12 800(0.17)12 400	Cordoned Pottery
	Odaiyamamoto I Kanita town in Aomori Prefecture in Japan	Charcoal	AMS ¹⁴ C	14 180	13 780	14 570	

Tab. 6. Radiocarbon Ages of Early Pottery in Russia and Japan.

est pottery in eastern Asia can be dated to 17 000 years BP, in the period of the last Pleistocene glaciations in Eurasia. It shows that the invention of pottery in eastern Asia was not connected with the warmer climate, at least. It could be the human adaptation to bad climate that accounts for the relations

between the climate and the invention of pottery. However, it can be proved probably that even in 17 000 BP the ancient people at the end of the late Pleistocene had an extraordinary ability to acclimatize themselves to the environment and to made great progress in technology.

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