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# The origins of pottery in East Asia and neighboring regions: An analysis based on radiocarbon data

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ABSTRACT

Patterns for the emergence of pottery-making in greater East Asia based on radiocarbon dates associated with the earliest pottery assemblages are presented. According to a critical evaluation of the existing evidence, the oldest centers with pottery in East Asia are located in South China (dated to ca. 18,000 cal BP), the Japanese Islands (ca. 16,700 cal BP), and the Russian Far East (ca. 15,900 cal BP). The claim for earlier pottery in South China at the Xianrendong Cave, supposedly dated to ca. 20,000 cal BP, cannot be substantiated. The appearance of pottery in other parts of greater East Asia was a slow process, without clear diffusion from any of these centers toward the periphery. In neighboring Siberia, the oldest pottery dated to ca. 14,000 cal BP is known from the Transbaikal.



## 1. Introduction

The emergence of pottery is one of the most important phenomena in prehistory (e.g., Jordan and Zvelebil, 2009; Kuzmin, 2013). It is widely accepted that the oldest vessels made of fired clay appeared first in greater East Asia, but discussions about the geographic position and timing of the earliest pottery-making cultural complexes are ongoing (Wu et al., 2012; Kuzmin, 2013, 2015; Cohen, 2013). The analysis of chronological patterns for the emergence of pottery in greater East Asia (as of mid-2016) is the main focus of this paper; the data from neighboring Siberia and Mongolia are also considered.

## 2. Material and methods

In order to conduct analysis of the earliest pottery complexes from chronological perspective, recent overviews on the emergence of pottery among hunter–gatherers in East Asia and neighboring regions are used here as a background (Kuzmin, 2013, 2015; Gibbs and Jordan, 2013, 2016; Gibbs, 2015; Jordan et al., 2016). The evaluation of $^{14}C$ dates for the early pottery complexes, as performed here, is critical for understanding the origins and spread of ceramics in the entire Old World. The newly published data on the early pottery from the Transbaikal (southern part of Eastern Siberia) (Razgildeeva et al., 2013) are included into the existing dataset for this region after examination. The calibration of $^{14}C$ dates was conducted with the help of the Calib 7.0.2 software (see Reimer et al., 2013), at ± 2-sigma, and all possible intervals are combined and rounded to the next ten years. Archaeological data, especially on the shape, decoration, and technological traits of the earliest pottery in East Asia (e.g. Kaner, 2009; Kobayashi, 2004; Lu, 2010; Pearson, 2005; Zhushchikhovskaya, 2005, 2009; see also Kuzmin, 2015), were also taken into account.

## 3. Results and discussion

### 3.1. South China

As is well-known, this region contains sites with very old pottery (e.g. Boaretto et al., 2009; Lu, 2010; Pearson, 2005; Wu et al., 2012). However, not all the $^{14}C$ records from southern Chinese

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sites are of equal quality, as it was pointed out before (e.g. Kuzmin, 2006). Therefore, analysis of the reliability for the chronological control for these sites ("chronometric hygiene" *sensu* Spriggs, 1989) is required.

The results of the latest studies at the Xianrendong Cave in southern China (Fig. 1) were published by Wu et al. (2012), with the $^{14}$C dates of the site's oldest component with pottery at ca. 16,915 BP (western section), corresponding to a calibrated age range of 19,950–20,880 cal BP. If we accept this conclusion at face value, this would be the oldest pottery in the Old World.

However, several important issues should be taken into account when evaluating the reliability of these dates (Table 1): 1) the stratigraphic association between the $^{14}$C-dated bone samples and the potsherds is not proven (see Wu et al., 2012: 1697); 2) a $^{14}$C value of 12,530 ± 140 BP (BA95145) (Table 1) obtained previously from Unit 3C1A, the second earliest site component with pottery, was ignored by Wu et al. (2012); and 3) some $^{14}$C dates, which do not fit the age model suggested by Wu et al. (2012) (see Table 1), were declared as 'outliers' without any reasonable explanation.

The fundamental difference between studies conducted at the Xianrendong site by Wu et al. (2012) and MacNeish (1999; see also MacNeish and Libby, 1995) is that the former team was not allowed to excavate before sampling (see Wu et al., 2012: 1697), while in the latter case a small part of the site's profile was excavated in 1993–1995 (MacNeish and Libby, 1995), with stratigraphic positions of pottery and samples for $^{14}$C dates securely documented. Therefore, the reliability of the $^{14}$C dating results obtained by Wu et al. (2012) was based totally on the results of excavation conducted by Chinese scholars after the R.S. MacNeish-led works (see Wu et al., 2012: 1697), and great caution should be used when these data are considered. In the latest publication (Cohen et al., 2016), it is stated that there are a few outliers in the Xianrendong $^{14}$C records but this again contradicts to what was published before by Wu et al. (2012) (see Table 1). Cohen et al. (2016) ignore the BA00009 date which is significantly younger that the rest of $^{14}$C values from Layer 3C1B with the earliest pottery (see Table 1). No explanations are given, and it can be assumed that there still many stratigraphic problems at the Xianrendong site which are not solved.

The disturbed nature of the Xianrendong Cave stratigraphy is demonstrated in Table 1 by several age–layer reversals. As a result, the chronological model created by Wu et al. (2012) is heavily biased toward the older $^{14}$C dates, and cannot be accepted as a reliable estimate for the pottery-containing strata of this site due to uncertainty between the stratigraphic position of potsherds and bones selected for $^{14}$C dating. According to a conservative age estimate approach (i.e. "chronometric hygiene"), the pottery from this site should be dated to ca. 14,700 cal BP, following the $^{14}$C age of 12,530 ± 140 BP (BA-95145) from the overlying stratum 3C1A (see Table 1), as the youngest reliable value from this layer. Therefore, it would seem necessary to remove the Xianrendong Cave from the corpus of the earliest pottery sites in South China.

At the Yuchanyan Cave, samples for $^{14}$C dating were collected

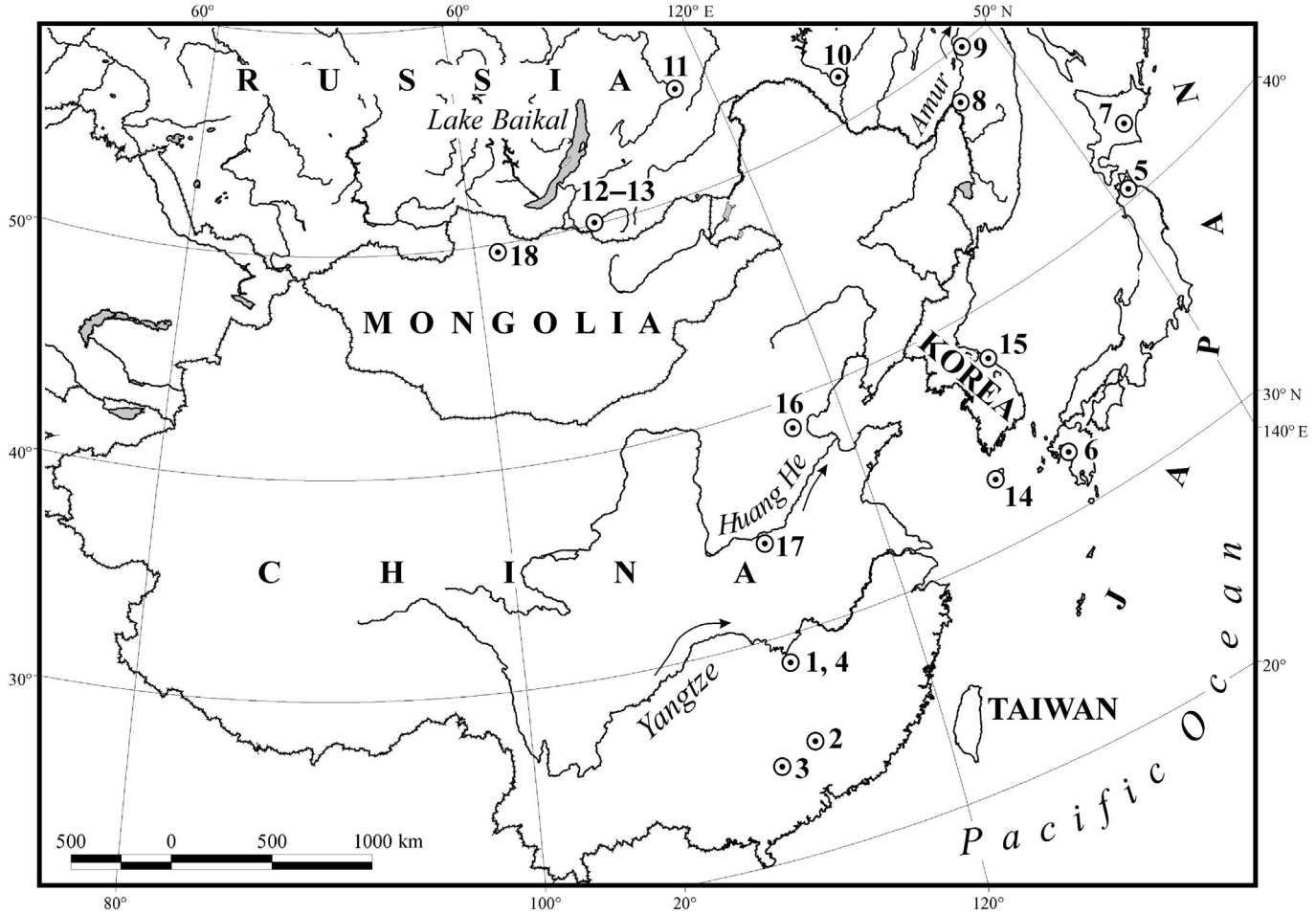


**Fig. 1.** Position of archaeological sites mentioned in the text and Tables 1 and 2: 1 – Xianrendong Cave; 2 – Yuchanyan Cave; 3 – Miaoyan Cave; 4 – Wang Dong Cave; 5 – Odai Yamamoto 1; 6 – Senpukuji Cave; 7 – Taisho 3; 8 – Gasya; 9 – Khummi; 10 – Gromatukha; 11 – Ust-Karenga 12; 12 – Studenoe 1; 13 – Ust-Menza 1; 14 – Kosanni; 15 – Osanni; 16 – Nazhuangtou; 17 – Lijiagou and Lingjing; 18 – Tolbor 15.

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