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Rethinking the origin of microblade technology: A chronological and ecological perspective

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ABSTRACT

There are four hypotheses on the origin of microblade technology in North China: i) that it originated from Siberia before the Last Glacial Maximum; ii) that it emerged in Siberia after the Last Glacial Maximum; iii) that it developed from the long-narrow flakes produced by the long-established knapping tradition in North China; and iv) that it had multi-regional origins, among which, a microblade industry may have emerged from the bipolar technology in northern China. Based on archaeological data from Siberia, Mongolia, the Japanese archipelago, Korean Peninsula, and North China, it is reasonable to say that the technological groundwork of Siberia was more substantial, and the initial microblade technology appeared in Siberia earlier than in the other areas. Microblade technology was involved in core preparation, systematic knapping, soft hammer and indirect/pressure flaking techniques, which were all present in the blade technology in Siberia but hardly ever evidenced in the traditional flaking technology systems in North China. It is well accepted that the microblade technology was closely related the high mobility of foragers to live in harsh environments. The climatic fluctuations of the last glacial in Siberia were more severe than in low latitudes, and placed greater subsistence pressure on hunter–gatherers in Siberia. The advantages of the initial microblade technology in dealing with these hostile circumstances encouraged foragers to employ and develop it, and finally generated its widespread use during the Upper Paleolithic through human migration and cultural transmission in Northeast Asia and North America.

1. Introduction

In general, microlithic technology can be divided into two traditions: one is the geometric microlithic technology used in Europe, North Africa, Southwest and South Asia and Australia and the other is the microblade technology found in North and East Asia, and North America (An, 1978). The concept of a microblade technology throughout this paper refers to the latter.

The Upper Paleolithic (UP) tendency toward microlithization was a global phenomenon. It is debatable whether the emergence of a microblade technology, a significant technical innovation for human adaptation in the terminal Pleistocene, resulted from cultural dispersal of the new technology or the appearance of new populations (Kuhn and Elston, 2002). In China, microblade remains have been researched for almost a century since Sven Hedin's Sino-Swedish Expedition in 1927–1935. Along with the discoveries of more and more microblade sites in the last few decades in North China, there has been much discussion of its relationships to other technologies, as well as its typology, morphology, and technological process, but the origin of microblade technology is still unclear.

As a representation of foragers' survival strategies, microblade technology spread extensively in northern and eastern Asia during the late Upper Paleolithic (LUP). While western scholars argue that microblade technology arose if not before, then shortly after, the Last Glacial Maximum (LGM) (Goebel et al., 2000; Goebel, 2002; Keates, 2007; Kuzmin, 2007; Seong, 2011), the origin and antiquity of microblade technology in China remain debatable. The development of dating methods in recent decades and English publications of chronological studies in Russia, Mongolia, Korea and Japan make it possible for us to know the distribution of the earliest sites with microblade assemblages. Additionally, the climatic changes during the Late Pleistocene revealed by high-resolution multi-proxy climate records are becoming clearer, and these are constructive for contextualising human survival mechanisms.

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In this paper, we argue that 1) it is logical to presume that the birth place of the microblade technology was high-latitude Siberia rather than North China, and its origin should be traced back to the early Upper Paleolithic, 2) microblade technology satisfied the technological demands of highly mobile hunter–gatherers, in particular by showing great advantages not only in hunting but also in processing resources to enable them to survive the long cold winters. These advantages consequently encouraged the spread of this technology throughout Siberia, Mongolia, the Japanese archipelago, Korean Peninsula, North China and North America during the last glacial.

Throughout this paper, all radiocarbon dates are uncalibrated unless otherwise specified.

2. Microblade technology

Misused definitions of a microblade technology have made it difficult to discuss the cultural traditions of different sites, and have led to controversies in China over the origin of the microblade technology. While some researchers insist that microblades are simply one of several types of small tools such as end scrapers, burins, and backed knives in Chinese palaeolithic assemblages (Jia et al., 1972), others argue that the microblade technology was a special one which involved microblade core preparation, soft hammer and indirect percussion and/or pressure flaking for producing microblades that were hafted in slotted organic tools; microblades were not therefore simply a type of small tool (e.g., An, 1978). Typical microblades emerged in the UP, and were also used after the UP accompanying chipped stone tools, ground stone tools and/or metal tools, simultaneously or respectively. Hence, it is preferable to accept the latter definition that the microblade technological remains stand for products of a special technology including microblades, microblade cores, and tools made with microblades. So-called microlithics from some Paleolithic sites, for instance, Shuidonggou Locality 1 in Ningxia, and the Xiaonanhai site in Henan, are actually unrelated to the microblade technology and should be re-examined when they are cited.

Kuhn and Elston (2002) indicated that microlithic technology in East Asia was characterized chiefly by microblades produced through an elaborately developed core technology and the finished tools have a standard size and shape. Core-preparation, soft hammer and indirect/pressure flaking technology were certainly fundamental for a microblade technology, and are not evidenced in the long-lasting flake technology system in China. In contrast to Kuhn and Elston's opinion (2002) that wedge-shaped microblade core technology in East Asia are specifically linked to a pressure flaking method, Zhao (2011) claims from experimental work and comparison with archaeological artifacts that both direct and indirect soft-hammer flaking methods can be used for making microblades from wedge-shaped cores.

3. Hypotheses on the origin of microblade technology

As stated above, there are four hypotheses on the origin of microblade technology. One argues for Siberia earlier than LGM (Kuzmin and Orlova, 1998). Kuzmin and Orlova (1998) once proposed that “the transition from macroblade to microblade industries seems to have occurred in Siberia ca. 23,000–20,000 BP”, and accepted ca. 23,500 BP as a maximum age for Ust-Mil 2, an early Dyuktai cultural site with a microblade technology, although the date and lithic assemblages of the Dyuktai culture were criticized as unreliable (Yi and Clark, 1985). Recently, earlier sites with a microblade technology in Siberia make scholars think that this technology arose much earlier, and perhaps as early as ca. 35,000 BP (Keates, 2007; Kuzmin, 2007).

In contrast, after analyzing Siberian sites, Goebel (2002) indicated that the sites with a microblade technology earlier than 18,000 BP are all problematic because of either inconsistent radiocarbon determinations or only one single dating result that needed to be replicated. He suggested that the scarcity of sites between 22,000–18,000 BP in Siberia indicates complete depopulation because of the extreme conditions during the LGM, and “the appearance of microblade technologies across Siberia following the LGM represents human recolonization of northern Asia during the late glacial”. He suggested that the technology originated in temperate Asia, perhaps in central or eastern Mongolia, and that the earliest well-dated wedge-shaped core and microblade industries appeared in the southern Baikal region about 17,500 BP.

The third speculation regards North China as the area of origin of a microblade technology, and is basically supported by Chinese scholars (Jia et al., 1972; An, 1978; Jia, 1978; Chen, 1984; Chen and Wang, 1989). Jia et al. (1972) hypothesized that two major parallel traditions persisted from the Lower to Upper Paleolithic in North China: one was the Large Triangular Point and Chopper-Chopping Tool tradition; the other was the End Scraper and Burin tradition. In the latter, lithic tool assemblages in northern China revealed a trend of diminishing size from early to late, and the typical microblade technology was supposedly rooted in the traditional flake technology. Some scholars (An, 1978; Jia, 1978) suggested that some UP sites represented the antecedent of a microblade technology, including Shuidonggou Locality 1 in Ningxia, Salawusu in Inner Mongolia, Shiyu in Shanxi, and Xiaonanhai in Henan, which were all dated before the LGM. On this hypothesis, the microblade-like artifacts in these early sites ultimately developed into formal microblades, and then spread out over the North Asia, East Asia and North America.

In contrast, the fourth and last hypothesis advises that a single origin and subsequent diffusion of a microblade technology is unlikely because of the concurrently early emergence of this industry in the Japanese archipelago, Korean Peninsula, and North China, and “for each of these early cases, microblade technology should be considered an outgrowth of Paleolithic industries in existence prior to the LGM” (Barton et al., 2007). In North China, “the presence of small microblade-like bipolar bladelets at Shuidonggou-2 suggests a potential technological substrate from which a classic microblade industry may have emerged” (Barton et al., 2007).

4. Early remains in Siberia, Mongolia, Japan and Korea

It is difficult to discuss the origin of a microblade technology without secure chronological data. Fortunately, reports of well-dated sites from Siberia, Mongolia, Japan, Korea and China facilitate chronological comparisons. Here, we synthesize the sites with identified microblades in Siberia, Mongolia, Japan and Korea before and round the LGM.

Until now, the earliest evidence of a microblade technology is reported in stratum 11 of the Ust-Karakol 1 site, which is situated above the Karakol River in the Altai Mountains (Derevianko, 2001; Derevianko et al., 2003). Six and a half meters thick, the archaeological deposit of this site contains 20 layers, among which layers 11A–9A yielded microblades and microblade cores. The total number of stone artefacts from stratum 11 is 385, including 17 microblades and 11 microblade cores (Derevianko and Shunkov, 2004). Sixteen microblades from stratum 10 were recognized, but no convincing microblade cores. In stratum 9 (total of 1099 lithic artifacts), three wedge-shaped cores and two conical shaped cores were identified, as well as 29 microblades (Derevianko et al., 2003; Keates, 2007). Stratum 11 was not dated, but the upper part of stratum 10 was dated to 35,100 ± 2850 BP (see Table 1) produced by