The Origins and Primary Types of Groundstone

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Following C.T. Thomsen’s “three-period” theory, British scholar John Lubbock defined “Old Stone Age” and “New Stone Age” based on tool manufacture technology and their morphological forms. Thus this began a new phase of understanding nature of Neolithic. Since then, with accumulation of archaeological data and progress of research around the world, debates on criteria of the beginning of Neolithic occurred frequently. In this paper, we will discuss one of these criteria: the emergence of groundstone and their primary types, on the basis of current research and new data from the field of world archaeology.

I. Emergence of Groundstone and Its Primary Types

Primary types of groundstone is defined here as those tools that occurred in the beginning and continued throughout time. We will first examine these tools that first emerged in different regions of the World.

In Japan Islands, the earliest type of groundstone occurred is the axe with grounded edge, dated to Upper Palaeolithic around 20,000–30,000 BP. During the Jomon period (c.a. 1,000 BCE–3rd century BCE), chipped stone is predominant types, while groundstone type is primarily of “stone axe” (including axe, adze, chisel). In the following Yayoi period (c.a. 3rd century BCE–3rd century AD), with the emergence and spread of agriculture, the use of groundstone types started to be intensive, showing new types of knife, arrowhead, and sword. Nevertheless, stone axes are still of primary type (Fig. 1).

In Australia, stone technology in Stone Age is classified as the “Australia core-tool and scraper tradition” and “Australia small-tool tradition,” while their subsistent strategy was still hunting-gathering. Within the core-tool and scraper tradition, axe with grounded edge appeared around 22,000–18,000 BP. After 5,000 BP, this core-tool and scraper tradition was replaced by the small-tool tradition which was characterized by blade tools. The axes, however, did not disappear but continue to be used in a great extend.

In China, groundstone tools were found within archeological sites of transitional period from Palaeolithic to Neolithic and across lands from north to south. Especially during 14,000–9,000 BP in south China, it was a clear fact that there was a co-existence between chipped stone tools and groundstone with grounded edges and grounded perforation. Within a few of these tools, morphological types include axes, adzes, chisels, as well as cutting tools and drill-shape tools; however, types of axes, adzes, and chisels are dominant (Fig. 2). In addition, in the northeast hunters-gatherers societies where chipped stone tools including microblades were primary toolkits, the earliest types of groundstone were also of axes, adzes, and chisels.

In Vietnam, Hoa Binh-Bac Son cultures (Mesolithic to Neolithic period, c.a. 10,000–5000 BP) were represented by predominant uniface-chapped pebble tools including elongated axes, short and broad axes, oval axes, and circular tools, as well as mortars and pestles. The only type of groundstone is axe with grounded edge. In following prehistoric cultures, additional groundstone type like hoes, spades, knives, and sickles, and other types started to increase.

Groundstone tools vary in the different part of the World, but share some characteristics that are shown on the types of these tools and that their toolkit consisted of axes, adzes, and chisels, among which axes are mostly notable. In some areas, the primary form of these tools appeared in Upper Palaeolithic and Mesolithic periods. In some parts of Japan, groundstone axes occurred along with chipped-stone axes. Within Upper Palaeolithic cultures, such as Xiachun Culture, there were also chipped stone tools in forms of axe-shaped, adze-shaped, and chisel-shaped. There were large axe-type tools existed in European Mesolithic cultures. Those chipped
stone tools must have been earliest forms of groundstone tools with edge grounded. Thereafter, grounded axes, adzes, chisels continued to appear in Neolithic and Bronze Age cultures. It is clear that these three types of groundstone tools should be the so-call primary types, or basic types.

II. Primary Types of Groundstone Tools and Advancement of Architecture Technology

Groundstone not only was one of nature of Neolithic, but also represented evolutionary changes in tool manufactures. The reason for this kind of change did not necessarily coordinate with the transition from Palaeolithic to Neolithic; it must be relied on the way of life in the Neolithic settlement.

Palaeolithic settlement are mostly limited to caves and open sites in the upperlands, which may not be ideal locations for human living. However, while living caves, Palaeolithic hominids also selected seasonally open-site in lowland and near lakes. At the Dela Amorta site at Nice city of southern France, archaeological excavations reveal small structures as later spring and early summer camp settlement. During the Upper Palaeolithic, such non-cave settlement camps are frequently found around the world. From those archaeological discoveries so far, we come to following understanding. First, during Upper Palaeolithic, human beings began to have desires to be living in the river plain and lakesides for permanent settlement, instead of cave living. Second, Palaeolithic structures were mostly likely made with animal bones, skins, and rocks. Wooden structures were relatively rare. Those structures thus were not durable but rough, not

Fig. 1 Major types of stone implements from late Palaeolithic to initial Jomon period in Japan

1. micro-stone tools and micro-blades 2. micro-cores and micro-flakes 3. micro-core 4. macro-spear heads 5. micro-spears 6. axes with polished edge 7. micro-stone edges 8. whet-stone with grooves (1, 2. late Palaeolithic period; 3–8. initial Jomon period)
good enough for human who desire for permanent settlement. Third, while it was easy to obtain animal bones for construction materials, the size and scale of the structures were limited due to the size of bones; thus Palaeolithic structures were not ready for evolutionary change yet.

Therefore, evolutionary change in structures called for new materials and technology. In Neolithic, woods
became one of major construction materials. In Japan, subterranean house structures were frequently found in early Jomon period, showing a series of post moulds (Fig. 3). The ceiling and beams must also have been made of woods, indicating technological advancement over Palaeolithic structures. The complicity of Chinese Neolithic also indicates that the use of groundstone tools was close associated with woodworking relating to house building. For instance, forms of groundstone tools from Yangtze River valley and southern China were complicate and delicate, accordingly in this areas wooden structures were well developed. However, in the areas of
Yellow River valley, Neolithic settlements were mostly underground house or subterranean house, therefore requirement for woodworking in this area is not as high as in the south. In the Three Gorges area, cultural development was rather different from abovementioned areas. In this area chipped stone existed in large quantity in the Bronze Age, while groundstone was rare. Those chipped stone included cores, flakes, and tools. Type tools included choppers, circular tools, axes, knives. However, groundstone tools, although few, have set of axes, adze, chisels, and wedges (Fig. 4).

Apparently, in the views of early Neolithic groundstone toolkits as well as natures of Neolithic culture diversity, it suggests that appearance of groundstone tools was closely related to woodworking and house constructions. Thus we conclude that the emergence of groundstone tools occurred during the transition from Palaeolithic to Neolithic, and in accordance with demands of technological advancement and increase of woodworking. In hunting-gathering economic subsistence, groundstone tools were likely used for making wooden tools, whereas in agricultural societies, the use of groundstone tools became intensified, thus grounding technique was the dominant method of tool manufacture. As a result, types of groundstone become more diversified.

### III. Functions and Significance of Primary Types

From the fact that those primary types of groundstone are the earliest ones to appear and continued, emergence of groundstone seemed not necessarily to have relation to introduction of agriculture, which is exemplified by evidence from Japan, Australia, and West Asia.

It is no doubt that axes, adzes, and chisels were woodworking tools. During Upper Palaeolithic and Mesolithic periods, there were evidence for the existence of woodworking tools. In Japan, wooden specimen were identified with worked marks from Noshiriko site in Naganoken (radiocarbon dating 37220 ± 1240 BP). Wooden boat, paddle, and bow were recovered from European Mesolithic. Theoretically speaking, tools of manufacturing wooden objects could not be wood, instead should be harder materials like stone. Thus existence of chipped axes, adzes, and chisels probably functioned as such tools. However, a main problem of using chipped stone tools on wood materials is that chipped working edge of the tools did not function well on wood. Therefore, chipped stones with grounded edges, like axes, adzes, chisels, were first appear to fit into this function requirement. Chipped stones were gradually replaced with well-developed groundstones for woodworking function. However, chipped stone tools still continue for other preferred function, co-existing with groundstone in some areas.

In West Asia, architectural technology was well developed at Pre-Pottery Neolithic Jericho, Moore, and Gan Ni. Da Ne sites prior to groundstone and pottery techniques, but that fact does not necessary that their construction technique has nothing to do with groundstone. In West Asia, house construction was applied with technique other than groundstone woodworking. At Na Tu Fu site, clay-bricks and stone were used in house building, while clay-brick techniques appeared in China as later as in Longshan 龙山 Culture around 3000 BCE. Although groundstone tool occurred related later in West Asia, woodworking tools like chipped adze and chisel developed clearly during Upper Palaeolithic. Especially in the Pottery Neolithic (PNA), the first types of groundstone were also combination of axes and adzes. Therefore, this also supports the view that emergence of groundstone was association with house construction.

From what we have discussed above, we should arrive at following conclusions: First, origins of groundstone has no direct relation to introduction of agriculture, especially true during early stage of agricultural origins. Second, although criteria using groundstone emergence for defining Neolithic is misinterpreted, the same is true for original agriculture and appearance of pottery to define Neolithic beginning. Thus, there is no single criteria to mark the beginning of Neolithic so far. Third, Neolithic, or New Stone Age, was created because the new form of groundstone, suggesting the process of cultural development—such process has been accepted by scholars worldwide. Thus, it is not necessary to, or could not, suggest a new term for this period. Last, from the view of origins of groundstone and their primary types, it is hardly to suggest that there would be a “Wooden Age” prior to “Stone Age.” Even if there were likely to have wooden tools used by hominids before using stone tools, such “wooden tools” are not evidence enough to mark an “Age” featuring wooden materials.

### References


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