

Excavations in 1988–1989 at the Mount Dagudui lithic quarry site in Xiangfen County, Shanxi

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Abstract

In 1988 and 1989, Shanxi Provincial Institute of Archaeology conducted excavation to the Mount Dagudui lithic quarry site. The excavation unearthed about 11000 lithic products, most of which were flakes, followed by spear-shaped blanks, knife-shaped blanks, spade-shaped blanks, hoe-shaped blanks, adze-shaped blanks, chisel-shaped blanks, cores, hammer stones and kitchen-knife blanks, etc. Mount Dagudui Site is very close to Taosi Site, and the shapes and categories of the stone products unearthed here are almost the same as those unearthed at the Taosi Site, and its ^{14}C dating data are also within the chronological scopes of the Taosi Site, therefore this site is attributed to the Taosi Period. As the only lithic quarry site of the Neolithic Age found in the Linfen Basin to date, Mount Dagudui Site is significantly meaningful for the researches on the stone tool production, resource utilization and the communication among the sites in the Taosi Period.

Keywords: Blanks (object genre); Mount Dagudui Site (Xiangfen County, Shanxi); lithics–petrography; Neolithic Age; quarries (extracting complexes); stone implements–industry; Taosi Period (24th–19th c. BCE)

A brief introduction to the site

The Mount Dagudui quarry site is located in Xiangfen County, Shanxi Province. It is 7km west away from the Dingcun Site and 7.4km north away from the Taosi Site (Figure 1). This site was discovered in 1984 by Shanxi

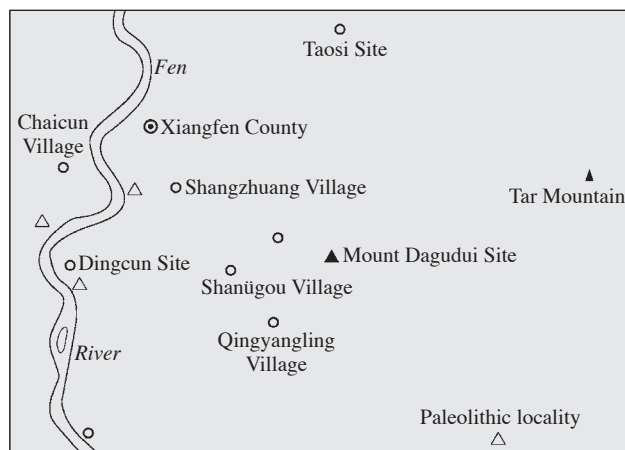


Figure 1 The location of the Mount Dagudui Site.



Figure 2 Mount Dagudui Site (S–N).

Provincial Institute of Archaeology which later carried out several times of archaeological investigation (Wang et al. 1987). The Mount Dagudui Site covers about 15ha, but the artificial relics were mostly concentrated on the southern slope (Figure 2). In this area, the lithic products overlaid each other and most of them were covered with sward and dust, so that it is very difficult to know the quantity of the lithic products. In order to understand the quarry site, Shanxi Provincial Institute of Archaeology carried out two times of excavations in 1988 and 1989 respectively (Wang and Zhu 1991).

In the beginning of the excavation, a permanent base point was set up at the top of Mount Dagudui, and the entire site was divided into four quadrants (zones) according to the base point. Moreover, a temporary base point was set up in Zone III 71m southwest of the permanent base point. The excavated place was set in Zone III too and 11 excavation grids with 5m in side length were opened. The deposit at the Mount Dagudui Site was very thick and lied on a southward declivity. The vertical excavated thickness was about 4m, and the thickest place could reach to 6.6m but the shallowest place was only less than 2m. The total excavated area was 275sq m, and about 11000 pieces of lithic artifacts unearthed were there, including flakes, spear-shaped blanks, ax-shaped blanks, knife-shaped blanks, spade-shaped blanks, hoe-shaped blanks, adze-shaped blanks, chisel-shaped blanks, cores, hammer stones and a kitchen knife-shaped blank.

The lithic artifacts unearthed from Mount Dagudui

The unearthed relics from Mount Dagudui were mostly lithic artifacts, including flakes, blanks, cores, hammer

stones, etc. The majority of the lithic artifacts were made of metamorphic sandstone, and less than 5% of them were made of andalusite hornstone. All of the lithic artifacts were made by flaking without any grinding trace. Based on the unearthed lithic artifacts, this site could be divided into three great strata. The lithic artifacts unearthed from the first great stratum were most abundant, being 85.8% of the total number. While there was no big difference among the lithic artifacts from the three great strata, those from the first great stratum were numerous and had various types including all the types from this site. The lithic artifacts from the second great stratum were a smaller number and were wrapped in a layer of calcic concretion without sharp edges. The relics from the third great stratum were similar to those from the first great stratum, but the lithic artifacts were much fewer in both quantity and type. In addition, the third stratum included a large number of rocks which might have been dropped from the bed rock. Due to the similarity of the lithic artifacts from the three great strata, we will only introduce those from the first great stratum in this report.

1. Flakes. There were a large number of flakes unearthed, about 7890 pieces, being 72.9% of all of the unearthed flakes unearthed from the three strata. The sizes of the flakes were various, but most were 8-12cm wide. According to the ratio of length and width, and the flake angle, these flakes could be divided into four types: long flakes with acute angle, long flakes with obtuse angle, wide flakes with acute angle and wide flakes with obtuse angle. Wide flakes with obtuse angle were the most, and long flakes with acute angle were the fewest. The flakes were mostly broken off with the flake scars left by former flaking as the platforms, and a few with the natural cleavage plane as the platforms. Platforms were seldom found to be purposely modified. On all the flakes, the points of impact and the compression rings were clearly seen. Moreover, the compression rings, hertzian cone, bulb of force could be found on most flakes too. These flakes all had sharp edges and corners.

Long flakes with acute angle: this type of flakes counted 265 pieces, the minority in the four types of flakes, being 3.3% of the flakes from this stratum. Sample T0955 ①:1 had an almost linear platform. Compression rings on the ventral side was very obvious and flaking traces could be seen on the dorsal side. This flake had a plunging termination. It was 14.4cm long, 7cm wide, 1.4cm thick, and its flake angle was 70° (Figure 3:2).

Long flakes with obtuse angle:

this type of flakes was 1080 pieces, being 13.5% of the total flakes from this stratum. Sample T0955 ①:2 had an artificial platform and a feathered termination. The lip of this flake was extrusive and the point of impact was clear. There was a flake scar on the dorsal side. It was 13.2cm long, 7.3cm wide, 1.6cm thick, and its flake angle was 104° (Figure 3:4).

Wide flakes with acute angle: this type of flakes was 836 pieces, being 10.5% of the total flakes from this stratum. Sample T0955 ②:2 had an abroad platform and a plunging termination. Its ventral side was typical conchoidal fracture with clear compression rings and sharp edges. It was 7.9cm long, 15.8cm wide and 2.3cm thick. Its flake angle was 61° (Figure 3:3).

Wide flakes with obtuse angle: this type of flakes was 5799 pieces, being 72.7% of the total flakes from this stratum. Sample T0955 ③:5 had an artificial platform with an extrusive lip. About 30% of its dorsal side was cortex. It was 7.2cm long, 10cm wide, 1.2cm thick and its flake angle was 109° (Figure 3:1).

2. Blanks. The types of blanks were diversified, including spear-shaped blanks, ax-shaped blanks, knife-shaped blanks, spade-shaped blanks, hoe-shaped blanks, adze-shaped blanks, chisel-shaped blanks and so on. They counted 1353 in total.

(1) Spear-shaped blanks. There were 1181 pieces of spear-shaped blanks, being 87.3% of the total blanks of this stratum and the majority of the blanks. They were

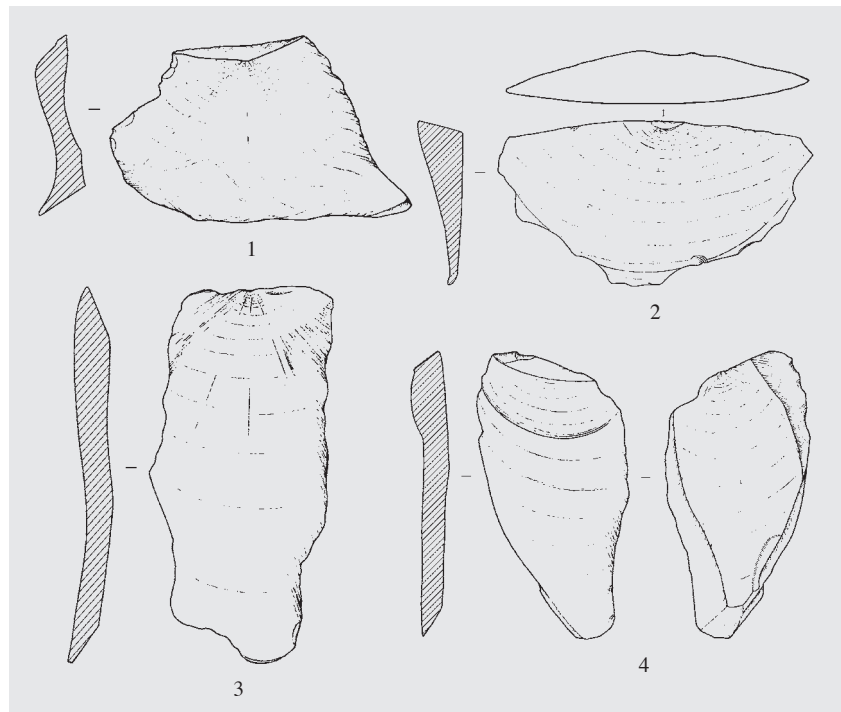


Figure 3 Flakes unearthed from the first great stratum.

1. Wide flake with obtuse angle (T0955 ③:5); 2. Long flake with acute angle (T0955 ①:1); 3. Wide flake with acute angle (T0955 ②:2); 4. Long flake with obtuse angle (T0955 ①:2).

unilaterally modified from the ventral side to the dorsal side of wide flakes. Based on the difference of the blanks' morphology, spear-shaped blanks could be divided into Types A, B and C. Among them, Type A was the majority and Type C was the minority.

Type A: 817 pieces. They have a truncated end and a pointed head. Spear-shaped blanks of this type were triangular in plan and could be divided into two subtypes.

Subtype Aa: 368 pieces. It had ridge and was almost triangle in intersection. Sample T0955 ③ :7 was mostly modified unilaterally from the ventral side to the dorsal side of a wide flake whose left side was truncated. But the retouch for the ridge was from dorsal side to the ventral side of the flake according to the flake scars on the blank. On the dorsal side of this blank, several scars could still be seen. It was 13.6cm long, 4.3cm wide and 3.3cm thick

(Figures 4:4 and 5).

Subtype Ab: 449 pieces. No ridge and trapezoid in intersection. Sample T0955 ① :14 was modified from the ventral side to the dorsal side of a wide flake and the end was thinned. The point of impact and compression rings on the back side of this blank could still be clearly seen. It was 15cm long, 6cm wide and 3.9cm thick (Figure 4:7).

Type B: 285 pieces. The head and the end were both truncated and it was trapezoidal in plan. This type could be divided into two subtypes.

Subtype Ba: 98 pieces. It had a ridge and was triangular in cross-section. Sample T0955 ① :17 had an upheaval ridge on the front side while the back side was a bit flat with retouched traces. This blank was modified unilaterally from the dorsal side to the ventral side of a wide flake and there were flake scars on both sides of the blank. It was 14cm long, 4cm wide and 4cm thick (Figures 4:1 and 6).

Subtype Bb: 187 pieces. No ridge. Sample T0955 ① :15 was unilaterally modified from the ventral side to the dorsal side of a wide flake. This blank's head and end were truncated. It was 10.5cm long, 6.7cm wide and 3cm thick (Figure 4:2).

Type C: 79 pieces. The head and the end existed and both were tip-shaped so that the front side was an approximate rhombus in plan. This type could be divided into two subtypes.

Subtype Ca: 51 pieces. Ridged. Sample T0949 ② :3 had a flat back side and a front side with an upheaval ridge. It was unilaterally modified from the dorsal side to the ventral side of a flake. It was 18cm long, 4.3cm wide and 4.8cm thick (Figures 4:10 and 7).

Subtype Cb: 28 pieces. No ridge. Sample T0956 ② :3 was uneven with flake scars on its back side, while the front side was flat but small. It was also unilaterally modified from the back side to the front side of the blank. It was 14.6cm long, 4.6cm wide and 3.1cm thick (Figure 4:9).

(2) Ax-shaped blanks. 46 pieces, being 95.8% of the total ax-shaped blanks unearthed from the three strata. They were modified with cores and were square in plan. Taking sample T1150 ① :2 as an example. Its top and left side used the natural plans of the nodule without any modification, while bi-directional modification was used on the right side of the blank. A few flake scars could be seen on the front

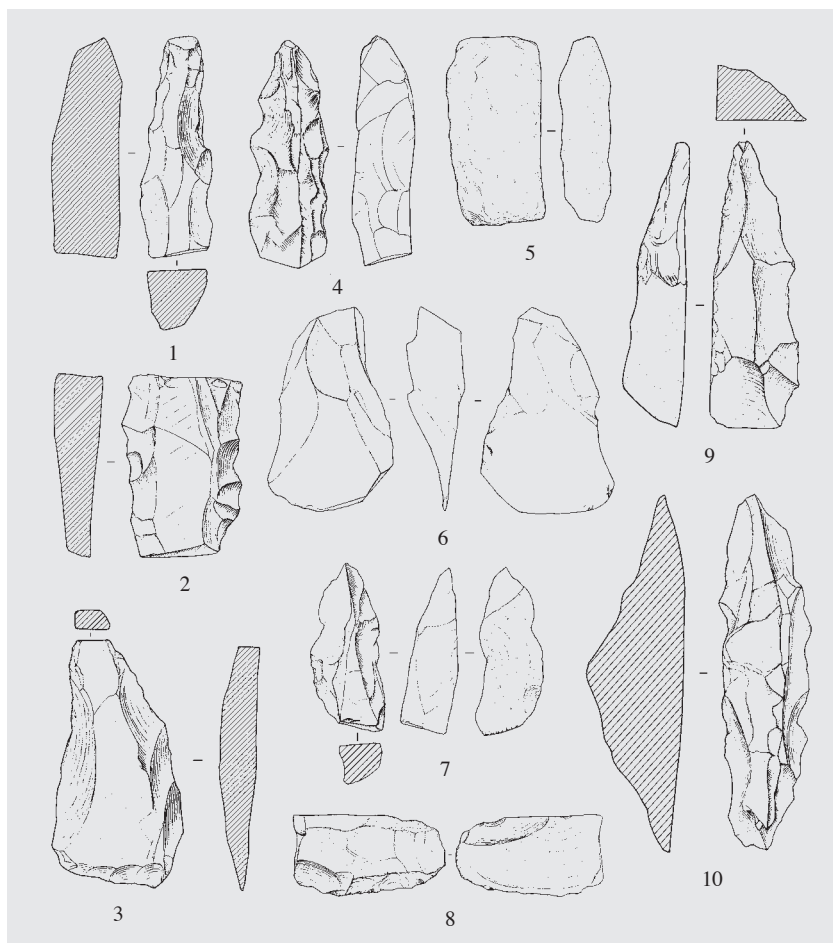


Figure 4 Stone blanks unearthed from the first great stratum.

1. Spear-shaped blank of Subtype Ba (T0955 ① :17); 2. Spear-shaped blank of Subtype Bb (T0955 ① :15); 3. Spade-shaped blank of Subtype Aa (T1150 ③ :1); 4. Spear-shaped blank of Subtype Aa (T0955 ③ :7); 5. Ax-shaped blank (T1150 ① :2); 6. Spade-shaped blank of Subtype Ab (T0955 ① :6); 7. Spear-shaped blank of Subtype Ab (T0955 ① :14); 8. Knife-shaped blank (T1150 ③ :9); 9. Spear-shaped blank of Subtype Cb (T0956 ② :3); 10. Spear-shaped blank of Subtype Ca (T0949 ② :3).



Figure 5 Spear-shaped stone blank of Subtype Aa (T0955 ③:7).



Figure 6 Spear-shaped stone blank of Subtype Ba (T0955 ①:17).

and back sides of the blanks, especially on the part close to the top, where further modification might need to be carried out. Its blade was a bit thick and need to be further modified. This blank was 16.8cm long, 8.5cm wide at top, 7cm wide at bottom and 5cm thick (Figure 4:5).

(3) Spade-shaped blanks. 38 pieces. They were modified out of wide flakes and could be divided into Types A and B.

Type A was narrower at the top and wider at the bottom without shoulder. According to the morphology of the blade, it could be divided into two subtypes.

Subtype Aa had a straight blade. They were 19 pieces. Sample T1150 ③:1 was modified from a wide flake. It was wider and wider from the top to the bottom. The impact point of the wide flake could still be seen on the back side of the blank. The top of the blank with cortex was the right side of a wide flake, whose platform and distal end were retouched a bit to become the two sides of the blank. All the retouch activities were carried out from the ventral side to the dorsal side of the wide flake. This blank was 14.3cm long, 7.4cm wide, 2.1cm thick. (Figure 4:3).

Subtype Ab had curved blades without shoulder. There were 19 pieces. Sample T0955 ①:6 was modified from a wide flake, and the blade was formed out of the sharp edge of the flake without any modification. The modification on the blank's body concentrated on the place close to the top and a few flake scars were clearly



Figure 7 Spear-shaped stone blank of Subtype Ca (T0949 ②:3).

seen. This blank was 18.5cm long, 10.4cm wide and 5.5cm thick. (Figure 4:6).

Type B were spade-shaped blanks with shoulders. Six pieces. Sample T1049 ② :3 had a few modification traces, but only one flake scar could be seen on the left side of the blank. The top of the blank and the blade were all covered with cortex. This blank was 16.2cm long, 8.7cm wide at the handle, 13.2cm wide at blade and 4.5cm thick. (Figures 8:6 and 9).

(4) Knife-shaped blanks. 32 pieces in total. They were modified with wide flakes and were rectangle in plane. Sample 1150 ③ :9 was modified with a wide flake with obvious flake characteristics. The platform was natural and the right side of the flake was truncated. The blade was modified unilaterally from the ventral side to the dorsal side of the flake. The back side of this blank was flat and the blade was curved. It was 7cm long, 13.4cm wide and 2.6cm thick (Figure 4:8).

(5) Adze-shaped blanks. 21 pieces. They were basically square, while some of them were slat-shaped with varying sizes. Their lengths were between 20cm and 5cm and their modification method was similar with that of the spear-shaped blanks. Sample T0956 ① :2 was slat-shaped and the top was truncated. The left side of the blank was straight with clear bilateral modification traces and the right side was a bit curved, while its blade was thick without any modification. It was 13.6cm long, 5.8cm wide and 3.9cm thick (Figure 8:3).

(6) Chisel-shaped blanks. There were 15 pieces and they were slat-shaped. They were all modified with wide flakes with a 3cm thickness and 5cm width. Sample T1150 ① :4 was modified with a wide flake whose platform was the left side of the blank. This modification was conducted from the dorsal side to the ventral side of the flake. The distal end of the flake was the right side of the blank and was unilaterally modified from the ventral side to the dorsal side. The blade was arc-shaped. It was 15.5cm long, 4.9cm wide and 2.1cm thick (Figure 8:4).

(7) Hoe-shaped blanks. 13 pieces. They were slat-shaped and were modified with wide flakes. Sample T1150 ③ :3 was truncated at the top and the blade was thin. The both sides of the blank were unilaterally modified. It was 17cm long, 5.8cm wide and 2.5cm thick (Figure 8:5).

(8) Kitchen knife-shaped blank. Only one piece. It was triangle in plan. Sample T0956 ① :4 was modified with a wide flake but no modification traces could be seen from the ventral side. Its handle had not been modified yet, while there were lots of flakes scars left by thinning and retouching on the dorsal side. The blade was arc-shaped. It was 16.1cm long, 25.2cm wide and 4.3cm thick (Figure 8:8).

3. Cores. The 91 cores unearthed from this stratum (as well as the entire site) could be divided into Types A (flat-shaped), B (column-shaped) and C (turtle back-shaped). The column-shaped cores were the majority. The flat-shaped cores were fewer, and the turtle back-shaped cores were the minority.

Type A, 36 pieces. They were flat-shaped cores with various sizes. This type of cores was thin and flaking was usually conducted on the front and back sides. Sample T0955 ② :3 kept nodule's natural surface with cortex on one side and taking this side as the platform, flaking was conducted. Clear flake scars could be seen on this

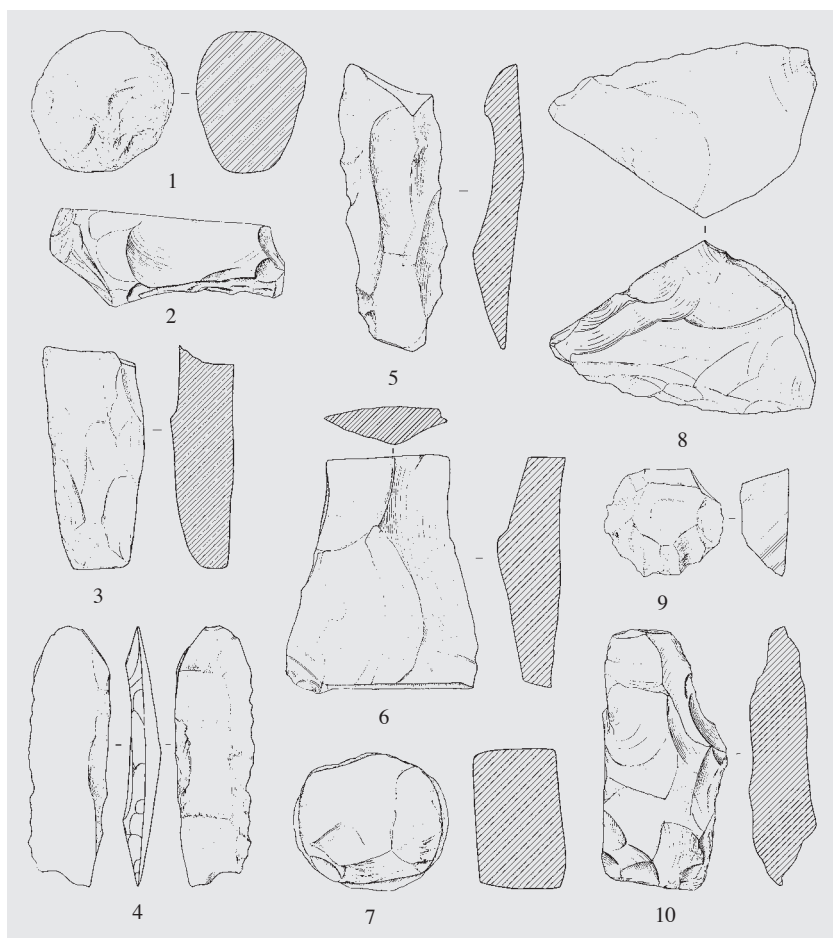


Figure 8 Lithic artifacts unearthed from the first great stratum.

1. Hammer stone of Type A (T0949 ② :1); 2. Core of Type A (T0955 ② :3); 3. Adze-shaped stone blank (T0956 ① :2); 4. Chisel-shaped stone blank (T1150 ① :4); 5. Hoe-shaped blank (T1150 ③ :3); 6. Spade-shaped blank of Type B (T1049 ② :3); 7. Hammer stone of Type B (T0949 ② :2); 8. Kitchen knife-shaped stone blank (T0956 ① :4); 9. Core of Type C (T0956 ① :3); 10. Core of Type B (T1050 ① :3).

core. Observing from the flake scars, the detached wide flakes were more than the detached long flakes. This core was 38.6cm long, 15.1cm wide and 9.1cm thick (Figure 8:2).

Type B, 37 pieces. They were column-shaped cores. Flaking was conducted surrounding the cores, or only from a certain facade. Sample T1050 ① :3 was rectangular in plan. Its left side was straight and was the natural surface of nodule, which was the platform for flaking too. This core was 24.4cm long, 11.5cm wide and 6cm thick (Figure 8:10).

Type C, 18 pieces. They were turtle back-shaped. Flaking was conducted mostly from the bottom to the top of the cores. Sample T0956 ① :3 was almost like a circle at the top and the bottom of the core. The top diameter was 6.8-7.4cm and the bottom diameter was 9.6-10.9cm and 4.9cm thick. Flaking was conducted along the edge of the bottom and the flake scars were overlapped (Figure 8:9).

4. Hammer stones. There were 27 pieces of hammer stones unearthed, and could be divided into Types A (sphere-shaped) and B (column-shaped) with similar sizes.

Type A: 19 pieces. They were sphere-shaped. Sample T0949 ② :1 was 9.5cm at biggest diameter and the flaking traces could be found all around the hammer stone (Figure 8:1).

Type B, eight pieces. Sample T0949 ② :2 was oval at the top and the bottom of the column. Its major axis was 10.5cm and the short radius was 8.6cm. This hammer stone was 6.5cm thick. The flaking traces could be seen at the bottom of the column and there was some cortex at the top of the column (Figure 8:7).

Discussion

The excavated place at Mount Dagudui was high in north and low in south. The bedrock could be seen at 5m underneath surface in each grid, showing that the terrain before the formation of the deposit was similar to that at present. A large number of lithic artifacts were discovered, including flakes, blanks, cores and hammer stones. All these lithic artifacts had big sizes. However, there was no lithic artifact with pecking or polishing traces discovered. Neither debris caused by pecking was found, indicating that Mount Dagudui might not have been a stone implement production workshop, but might only have been a quarry and primary production workshop. The export might mostly have been the blanks, or even included raw material.

1. The characteristics of the lithic artifacts from Mount Dagudui: The lithic artifacts unearthed from Mount Dagudui were numerous and various in types. They had very clear characteristics, which could be summarized into the following:

(1) Flakes were the majority, being 84.8% of the total lithic artifacts. The number of blanks was 13.8% of the total lithic artifacts. The cores and the hammer stones were 1% and 0.4% respectively.



Figure 9 Spade-shaped stone blank of Type B (T1049 ② :3).

(2) The thick and big flakes with about 8cm largest diameter were the majority and had clear characteristics. Half of the flakes had so extrusive bulb of impact that made the ventral side of the flakes drum belly-shaped. Wide flakes were the majority, being 81.1% of the total flakes. And the obtuse angle flakes were the majority in both long flakes and wide flakes.

(3) The platforms of flakes had natural and artificial types, but the natural platform were very few. Taking T0955 ③ as an example, the flakes with natural platform were 16.7% of the total flakes unearthed from this stratum. Moreover, the artificial platform also used the flake scars left by previous flaking. It was very rare to artificially retouch the platform for efficiently flaking. It might be due to the better bedding of the raw materials that make the lithic surface very flat after flakes detached. So the ventral or dorsal sides of the flakes could be used as platforms. In addition, the raw material from Mount Dagudui was bulk-shaped. Even the natural surface of the raw material was very flat and could be directly used without modification. Therefore, some blanks were made by using the natural surface of raw materials as platforms.

(4) The blanks had various types, including spear-shaped, ax-shaped, spade-shaped, adze-shaped, chisel-shaped, hoe-shaped and kitchen knife-shaped blanks. Among them, there was only one kitchen knife-shaped blank, but 1334 pieces of spear-shaped blanks. The

quantities of other blanks were 10-50 pieces. Type A spear-shaped blanks were the majority, taking 69.8% of the total spear-shaped blanks. Then Type B was 23.8% of the total spear-shaped blanks. The total number of Type C was less than 100 pieces, 6.4% of the total spear-shaped blanks. Spade-shaped blanks could be classified into shouldered and no shouldered. But the spade-shaped blanks with shoulders were very few. There were only six pieces unearthed from the site and all the six pieces were unearthed from the first great stratum.

(5) The blanks were basically flake blanks except ax-shaped blanks which were core blanks. Flake blanks were mostly modified from wide flakes and the flaking was mainly conducted from the ventral side to the dorsal side. Bilateral modification traces could be usually seen on spade-shaped blanks, knife-shaped blanks and the retouched edges. Flake blanks were usually made by truncating the distal end of wide flakes plus different-level modification. Different blanks had different requirements for the thickness of flakes and the truncated distal end size. Generally speaking, wide flakes used to be made into knife-shaped blanks and hoe-shaped blanks were thinner and their distal ends were more truncated.

(6) The lithic artifacts from Mount Dagudui were numerous but their petrography was sole, which were mostly metamorphic sandstone and a few andalusite hornstone. At Mount Dagudui, the outcrops of metamorphic sandstone and andalusite hornstone were found. Therefore, the raw materials of the lithic artifacts from Mount Dagudui would have been quarried locally.

2. The chronology of the lithic artifacts of Mount Dagudui: during the excavation at Mount Dagudui, pottery relics were only found in the surface soil layer. This made trouble to the dating of the Mount Dagudui Site. Currently, the site could only be dated according to the lithic artifacts discovered in Linfen Basin. The lithic artifacts unearthed from the different stratum did not have difference in type. But those from the first great stratum included all the types of this site, so they will be taken as examples to analyze the chronology of this site. The chronology of the lithic artifacts from the second and third great strata was not much earlier than those from the first great stratum.

The unearthed blanks from the first great stratum mainly included spear-shaped, spade-shaped, knife-shaped, ax-shaped and adze-shaped blanks and so on. Spear-shaped blanks were also found in the investigation at Taosi and their morphology were the same as Types Aa, Ab and Bb of Mount Dagudui (Zhai 2013). While the lithic spade dating to the Early Taosi had a slight shoulder, it became clear in the Late Taosi (Shanxi Archaeological 1980). The shouldered spade-shaped blanks from Mount Dagudui were similar to those from Taosi. Also the knife-shaped and adze-shaped blanks were similar in morphology to their counterparts at Taosi. Due to this,

it was assumed that the Mount Dagudui Site could be dated to the Taosi Period. In addition, the charcoal from the bottom of the site was dated to 2305±109 BCE by the Radiocarbon Dating Laboratory of Peking University, corresponding to the Early Taosi, showing that Mount Dagudui might have been used since the Early Taosi. Moreover, the investigation on lithic products at Taosi also indicated that numerous lithic artifacts found at Taosi from the Early to the Late Taosi Period were made of the raw material from Mount Dagudui. Therefore, it could be assumed that Mount Dagudui was used from the Early Taosi until the Late Taosi.

The Mount Dagudui Site is very close to the Taosi Site, especially the Gouxu Village which is in the southwest of the Taosi Site and is only 4km away from Mount Dagudui in a straight distance. In recent years, a large number of lithic artifacts were found during the excavation and investigation at Taosi Site. These lithic artifacts were made of the same raw materials as that of the Mount Dagudui Site, showing the close relationship between these two sites. The Dagusuishan Site, as a sole Neolithic stone implement quarry site in the Linfen Basin, played a significant role in the studies on the lithic industry, lithic resource utilization and the communications among the sites.

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Postscript

The original report published in *Kaogu* 考古 (Archaeology) 2014.8:7–19 with 15 illustrations was authored by Xiaodong Zhu 朱晓东 and Shaodong Zhai 翟少冬. This abridged version is prepared and translated into English by Shaodong Zhai.