

# THE TRANG KENH JEWELLERY WORKSHOP SITE: AN EXPERIMENTAL AND MICROWEAR STUDY

Nguyen Thi Kim Dung

Institute of Archaeology, 61 Phan Chu Trinh, Hanoi, Vietnam

## ABSTRACT

*The Trang Kenh site, a Bronze Age workshop for manufacturing nephrite (jade) ornaments is located near the sea in Hai Phong Province, northern Vietnam (Minh Duc commune, Thuy Nguyen district). It was discovered in 1968 and excavated twice in 1969 and 1986 over an area of 265 square metres by teams from the Institute of Archaeology in Hanoi (Thi 1970; Dung 1990). The site is dated to the late 2nd millennium BC on the basis of five radiocarbon dates.<sup>1</sup> The cultural layer is between 1.8 and 2.1 m thick with abundant stone artefacts, pottery, mollusc shells, animal bones and teeth. Especially remarkable is the debris from the manufacture of nephrite ornaments such as bracelets, small rings and beads, and the tools for making these; such as saws, chisels, jasper drill bits and gouges, and nephrite adzes. It is believed that Trang Kenh was a specialised manufacturing settlement making ornaments for exchange with other communities of the late Phung Nguyen and Dong Dau cultures in the Red River Valley whose burials frequently contain finished jade ornaments of these types.*

## THE ORNAMENTS AND MANUFACTURING TOOLS FROM TRANG KENH

A classification of the ornaments from Trang Kenh is presented in Table 1 and the tools, working debris and other pieces are illustrated in Figures 1-3 and listed in Table 2. Table 3 presents a breakdown of the traces of manufacturing on the unfinished ornaments. No change in the type of material or tools can be seen throughout the different layers of the occupation deposit and the material is treated here as a single group. Because of the exceptional importance of this site the author has made a detailed microwear study of this material backed up by experiments in making nephrite beads and a bracelet.<sup>2</sup> It is worth noting that only one other similar prehistoric jade ornament manufacturing site is known in Vietnam, at Bai Tu in Hai Bac Province. To my knowledge no comparable site has been identified in China where jade has been used on a much greater scale over a longer time period.

Table 1 Types of jewellery at Trang Kenh

Excavation	Finished Bracelets	Unfinished Bracelets	Finished Ear Rings	Unfinished Ear Rings	Finished Finger Rings	Unfinished Finger Rings	Finished Beads	Unfinished Beads	Finished Special	Unfinished Special	Dagger-axe	Total
1969	366	12	138	0	3	0	39	30	1	0	3	592
1986	178	48	64	68	7	0	33	39	3	3	1	443
Test Pit	25						20					45
Totals	569	60	202	68	10	0	92	69	4	3	4	1080

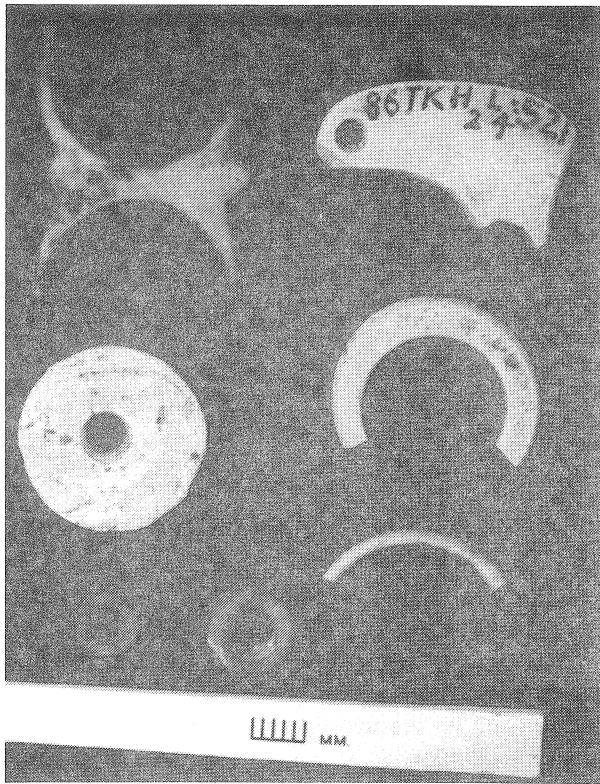


Figure 1: Unfinished and broken jade ornaments, Trang Kenh (Photo by I. Glover).

#### MICROWEAR STUDY OF DRILL BITS AND GOUGES

For the study a Nikon microscope with a X40 lens was used and the archaeological and experimental wear traces were photographed and compared at 40 and 100 magnifications. Of the 483 drill heads found at Trang Kenh more than half had been used and the finished ones can be divided in to two types: drills with a ground circular cross-section and the others which I call gouges, flaked abruptly to give an almost square cross-section between 2 and 5 mm across (Figure 4). Most of these tools were between 1 and 3 cm long with the cutting end narrowed by flaking and wear. Four types of wear could be distinguished under the microscope:

Type A: Lustrous, shiny and reflective polish.

Type B: Rounded wear on the U-shaped drill ends (Figure 5).

Type C: Diagonal scratches on a V-shaped gouge end.

Type D: Blunt drill ends (Figure 6).

The lengths of the used parts of the drill heads depend on the type of work each was designed for. Some tools with Type A wear were probably employed on wood

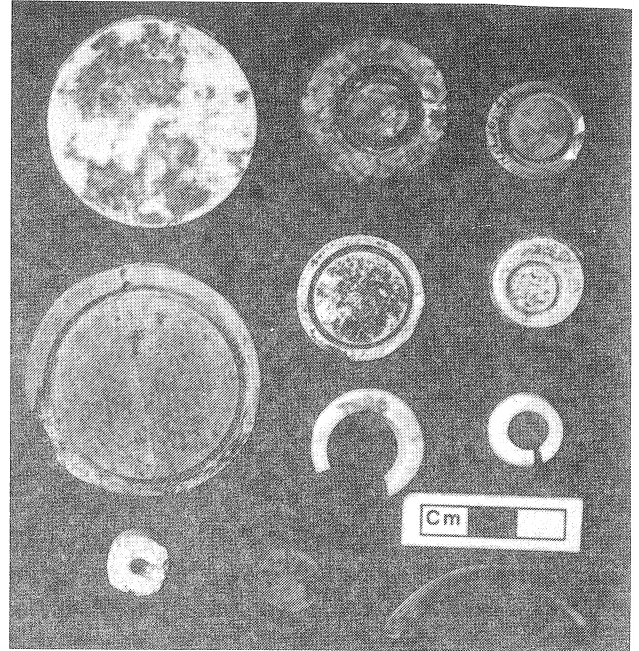


Figure 2: Unfinished jade disc cores, rings and bracelets, Trang Kenh (Photo by I. Glover).

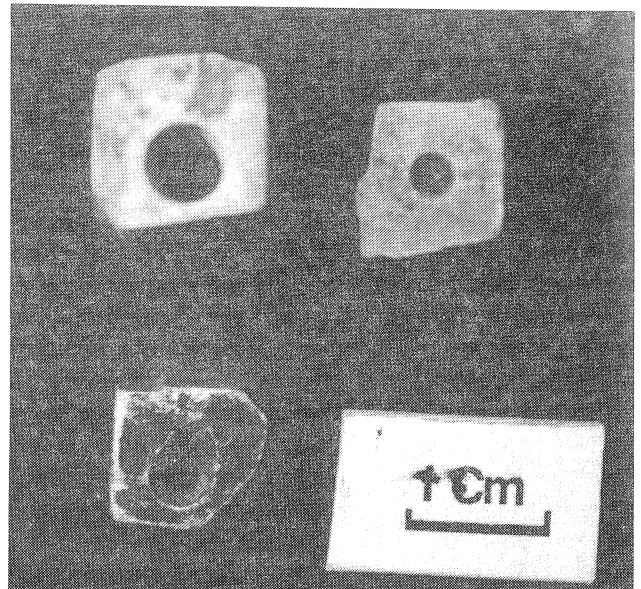


Figure 3: Unfinished jade beads, Trang Kenh (Photo by I. Glover).

which is softer than the drill material. Experiments show that drills used on wood and bamboo develop a shiny polish similar to that on the archaeological tools. Other tools with a cylindrical shape and Type A smooth working surface, together with those with Type B wear, were

Table 2 Types of jewellery-making tools at Trang Kenh

Excavation	Discoid cores	Axes	Chisels	Punch-edge chisels	Saws	Finished Drills	Unfinished Drills	Grinding stones	Sawn waste stone	Small flakes and pieces
1969	517	133	171	10	15	93	5	2041		
1986	368	86	105	28	303	265	45	627	6158	66360
Test Pit	50	9	7			75		86		
Totals	935	228	283	38	318	433	50	2754	6158	66360

Table 3 Analysis of unfinished ornaments from the 1986 excavation by type, manufacturing technique and size

Thickness	Bracelets	Bracelets cut from disc core	Ear Rings Flaked & sawn	Ear Rings cut from disc core	Cylindrical Beads	Small thin bead pieces	Beads made by line drilling	Special types
> 2 mm	10	0	0	0	0	0	0	0
1.5-1.9 mm	7	0	0	0	0	0	0	0
1.0-1.4 mm	9	15*	10	16**	0	0	4	0
0.5-0.9 mm	17	0	15	15***	18	0	4	3
< 0.5 mm	0	2	0	12****	0	17	0	0

\*Diameter of drill cut is > 4 cm

\*\*Diameter of drill cut 3-3.9 cm

\*\*\*Diameter of drill cut 2.5-2.9 cm

\*\*\*\*Diameter of drill cut 1.5-2 cm

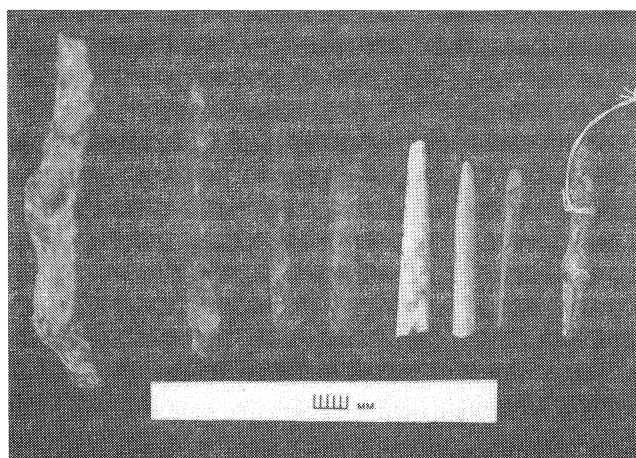


Figure 4: Drills and gouges from Trang Kenh in various stages of use. The one on right is bronze (Photo by I. Glover).

probably used in bead-making, while the wear on Type C gouges probably resulted from cutting out the centres from circular discs to make bracelets.

At Trang Kenh we found a large number of unfinished ornaments which, together with the tools, identify the site as a production centre. Raw nephrite blocks were sawn into flat slabs 6-8 cm long and then flaked by abrupt retouch into circular cores 3-8 cm in diameter and 0.5-1.9 cm thick before the faces were polished flat (Figure 2). The drilled-out centres of the bracelets, which started at about 6 cm in diameter, were re-used many

times to make increasingly smaller rings from 1-5 cm across. Many small pieces were shaped into beads, first by sawing and cutting before being polished and drilled with holes 0.4-0.7 cm in diameter.

Manufacturing traces on unfinished pieces were examined by microscope and classified into two types. Those with circular furrows 2-3 mm across are evidence for bracelet manufacturing (Figure 2), whereas those with unfinished holes ending in a point are evidence for drilling (Figure 3).

#### EXPERIMENTAL WORK

Experiments were made to drill holes in nephrite beads and to cut out the centre from a disc in order to make a nephrite bracelet. A jasper drill point and a gouge from the archaeological deposits at Trang Kenh were used in both experiments. The drill itself was based on a bow-drill type still used by the Muong and Thai ethnic groups in Vietnam which is made entirely of wood, bamboo and organic fibre string. Its name, when translated, means "disc-drilling instrument". Similar drills have been used in many parts of the world by pre-industrial communities (Piperno 1971; Semenov 1974; Calley and Grace 1988). In Vietnam a drill of this type nearly 2000 years old was found in the excavation of a grave at Dung Du (Dinh Van Kien and Le Xuan Diem 1972: 244-6) (see Figure 7).

When boring holes in hard dry wood such a drill revolves at 10 to 12 revolutions per second and after 180 minutes of uninterrupted work a polish develops which is



Figure 5: Microphotograph (X40) of Type B wear (obtuse) on drill head from Trang Kenh.

similar to that found on the archaeological drill bits. When boring holes in nephrite to make beads it was found better if the drill turned rather more slowly, at 7 to 8 revolutions per second, and if water was used as lubricant, otherwise the drill bit would break or small chips would be flaked off. After 50 minutes of work a hole 1-2 mm deep was made and the drill head had developed an obtuse blunted end with the Type B wear described above.

To make a bracelet, the flat polished disc core was fastened with bamboo or wooden nails to a rotating wooden wheel, similar to a potter's wheel, while a wooden bar held the gouge mounted in a wooden support vertically above the disc about 1.5 cm from the centre. The wheel was slowly turned while the gouge was pressed against the surface creating a circular furrow. Water with powdered stone abrasive was added to the groove. When this was about 2 mm deep the disc was reversed and a new groove started exactly opposite. After

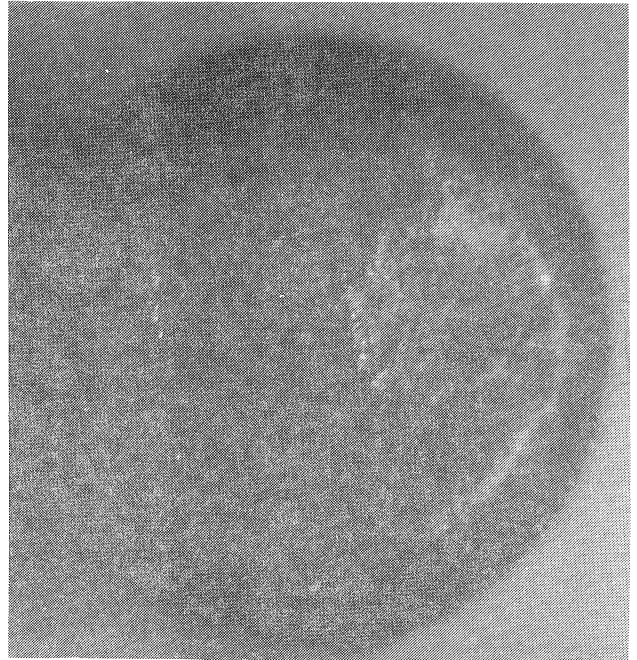


Figure 6: Microphotograph (X 40) of Type D wear (blunt) on drill head from Trang Kenh.

four hours work two circular furrows with U-shaped cross sections were cut, 2.5 mm across and 4 mm deep, leaving a central disc 3 cm in diameter which was punched out. This disc could then be reused for making yet smaller items and, finally, beads. Four gouges were used, yet the experiment did not last long enough to produce wear traces on their edges.

It has been sometimes been suggested that tubular bamboo drills were used with abrasive sand for removing the centres from jade and other hard stone bracelets in prehistoric Southeast Asia. While this technique has been tried by the author it was not used in the experiments reported here because the stone drills and gouges found at Trang Kenh suggest that other cutting techniques were used. The wear patterns produced by bamboo are also very different from those observed on the waste material from this site.

#### CONCLUSIONS

The microwear observations on tools, finished nephrite ornaments and waste material from Trang Kenh, supported by experiments, indicate a rather high level of development using quite complex tools for jewellery manufacture in the late second millennium BC in northern Vietnam. Nephrite ornaments were produced in large

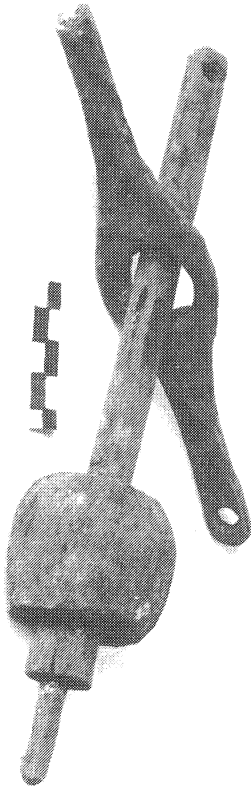


Figure 7: An excavated wooden bow drill from the Dong Son culture site of Dung Du, Haiphong.

quantities for exchange with other communities further inland and perhaps overseas. It is unlikely that the source of the nephrite used was located in the alluvial delta in which the site is located and so the economic reason for the location of this specialised manufacturing site is not yet understood. Microwear studies on the drill bits indicate that wood-working was also carried out at the site, but this material has not survived. The author's experiments, supported by careful observation of ancient manufacturing debris and microwear traces, demonstrate at least one practical method for drilling beads and for cutting centres from nephrite discs with a pre-industrial technology. However, it is not claimed that every problem is resolved and other techniques may also have been used.

#### NOTES

1 The following (uncalibrated) radiocarbon dates have been obtained for charcoal samples from Trang Kenh:

1969 excavation, Trench 1B, 3005±100 BP (ZK-307) at 1.4 m from the surface.

1969 excavation, Trench 1A, 3405±90 BP (Bln-891) at 1.9-2.1 m.

1986 excavation, M1 Trench 1, 3260±150 BP (Bln-3710) at 1.6-1.8 m.

1986 excavation, M1 Trench 1, 3250±55 BP (AA-2772) at 1.6-1.8 m.

1986 excavation, M2 Trench 2, 3340±70 BP (AA-2773) at 1.8-2.0 m.

2 This paper presents a brief summary of the author's many years of research which are described in full in Vietnamese in her doctoral thesis (Dung 1991). Preliminary publications are also listed below (Dung 1975, 1985, 1988, Dung and Doan 1984).

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