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CRAFTING CONTROL AND THE CONTROL OF CRAFTS: RETHINKING THE MOUNDVILLE GREENSTONE INDUSTRY

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Some archaeologists argue that centralized control over economically vital tools and resources was a common strategy by which chiefs came to power in complex, non-state societies. Other archaeologists argue that relations of inequality were negotiated and produced through the elite control of display goods, rather than utilitarian items. An investigation of the Moundville greenstone industry is particularly relevant to this debate as the raw material known as greenstone, a chlorite schist that outcrops in northeast Alabama, was used to manufacture both elaborate display items and basic subsistence tools. Evidence for centralized production of greenstone display goods contrasts with an absence of evidence for centralized production of utilitarian celts. Thus, relations of inequality at Moundville appear to have been produced more directly through chiefly control of material symbols rather than utilitarian economic items.

Southeastern archaeologists have long emphasized the importance of craft production in elite strategies to consolidate power and intensify production activities (Brown et al 1990; Muller 1997; Steponaitis 1991; Welch 1991). Literature on Mississippian political economy, however, has only recently begun to address differences between utilitarian and non-utilitarian craft industries and technologies (Cobb 1989, 2000; Koldehoff 1986, 1989; Muller 1984, 1986; Pauketat 1997a). Utilitarian and non-utilitarian goods differed not only in the scale of production but also in the community segments in which they circulated. Manipulation of non-utilitarian display goods allowed the elite of Mississippian societies to forge alliances with their high-ranking peers and to demonstrate their connections with the cosmologically distant and unknown (*sensu* Helms 1979). Dominating the circulation of utilitarian tools used in household-level economic activities, on the other hand, would have provided chiefly administrators with more direct and coercive control over the means of production (see Earle 1997:70-75).

Evidence of large-scale labor projects and the mobilization of foodstuffs indicates that the Moundville elite appropriated a considerable amount of labor from local populations in the Black Warrior Valley of west-central Alabama (Knight and Steponaitis 1998; Peebles and Kus 1977; Welch and Scarry 1995). To understand better the nature of an authority that could command such effort, I evaluate the degree of elite control exercised at Moundville over utilitarian versus non-utilitarian craft goods—specifically, greenstone artifacts. I begin with an examination of greenstone artifact production at Moundville. This is followed by a consideration of Mississippian greenstone artifact use in Moundville domestic contexts, and an examination of curation and recycling activities to assess the availability of greenstone artifacts at Moundville.

This investigation is relevant to recent research on Mississippian political economy and chiefdom studies in general as it considers the underpinnings of elite political authority. Earle (1997) has argued that achieving control over "staple" items may represent a significant transformation in the power of elites. Thus, chiefs come to power by controlling access to fertile soils, water, or other economically vital resources. Others have emphasized the importance of craft production in chiefly strategies of political consolidation (Frankenstein and Rowlands 1978; Helms 1979, 1988; Pauketat 1997b). From this perspective, elite political and religious authority is based on the control of material symbols or "prestige goods" necessary for ceremonial display and other social transactions.

An investigation of the Moundville greenstone industry is particularly relevant to this debate because the raw material known as greenstone, a chlorite schist that outcrops in northeast Alabama (Figure 1), was used to manufacture both elaborate display items and basic subsistence tools (Gall 1995). By sorting greenstone artifacts into socially relevant categories, we may better understand how relations of social inequality were produced and maintained in the late prehistoric Black Warrior Valley.

A Model for Production

Welch (1991:164-165, 1996:81) has argued that the production of utilitarian greenstone celts was centralized at Moundville, based on (1) the identification of greenstone production debris north of Mound R, (2) the presence of greenstone celt preforms in the Moundville Roadway collection, and (3) the absence of production debris at outlying sites in the Black Warrior Valley. This argument for centralized production has profound implications for Moundville's political economy. By controlling access to greenstone celts, the Moundville elite would have effectively controlled the ability of commoners to clear agricultural fields and conduct other basic tasks like house construction. Thus, in dominating the production and distribution of greenstone celts, the Moundville elite could have exerted control over the agricultural means of production in the Black Warrior Valley.

My analysis disputes the evidence offered in support of this argument. In fact, there is a lack of definitive evidence for celt manufacture north of Mound R, and the greenstone celt preforms identified by Welch represent recycling activities, not primary production. To model processes of production more accurately, I summarize the material correlates for different stages of greenstone tool manufacture and, in so doing, draw upon ethnographic studies of celt production by the Maori of New Zealand and the Langda of New Guinea (Best 1974; Burton 1984; Toth et al. 1992). This analysis is also informed by my own production experiments in which I manufactured several celts from unworked greenstone cobbles.[1] Through these experiments, I acquired a familiarity with the workability of Hillabee greenstones and documented the material byproducts of various stages of tool production. I propose three general stages of greenstone celt manufacture (Table 1).

Stage I: Primary Reduction

Hillabee greenstones occur as large boulders and smaller cobbles with a yellowish-brown cortex. Many cobbles are available at Hatchet and Gale creeks in east-central Alabama, where they have eroded from the parent formation (Figure 1; Gall 1993). Toolmakers likely selected cobbles of the appropriate size and shape for the tools they were manufacturing. The first stage of celt production would have entailed direct percussion flaking to produce a blank or preform (Best 1974; Burton 1984; Toth et al. 1992). My production experiments revealed that, if platforms are properly prepared, large flakes can be removed from raw greenstone cobbles. At the location of production, byproducts of this initial reduction procedure would comprise large deposits of unpolished greenstone flakes and shatter; also present would be rejected nodules and preforms and exhausted hammerstones (Toth et al. 1992).

Stage II: Fine Flaking and Pecking

The next stage of celt manufacture involved more detailed flaking of the blank to create a narrower, thinner, and more symmetrical shape (Best 1974). Pecking would be subsequently employed to remove any remaining irregularities of the celt preform. These activities likely required the use of hammerstones of different sizes and shapes (Toth et al. 1992). Archaeological signatures of this process would include numerous small unpolished flakes, exhausted hammerstones of multiple sizes and shapes, and late-stage production failures and rejects (Table 1; Best 1974; Toth et al. 1992).

Stage III: Grinding

The final stage of celt production entailed the grinding and polishing of celt preforms against a wetted sandstone slab (Best 1974; Dickson 1981:151; Toth et al. 1992). The grinding process is extremely labor intensive. In both the Maori and Langda examples, grinding was only initiated when all major irregularities had been removed from a celt preform through production Stages I and II (Best 1974; Toth et al. 1992). The end results of this process are finished celts, the only byproduct being large sandstone slabs (or slab fragments) with grooved abrasions (Best 1974; Toth et al. 1992).

Table 1. Stage-specific correlates of utilitarian greenstone tool production.

Production Stage	Products	Production Refuse
Stage I	Blanks/Rough Outs	Large deposits of unpolished greenstone flakes; rejected nodules; exhausted hammerstones
Stage II	Preforms	Small unpolished flakes; multiple sizes of exhausted hammerstones; late stage production failures
Stage III	Finished Tools	Sandstone slabs with grooved abrasions

Figure 1. Locations of the Hatchet Creek (H) and Gale Creek (G) greenstone source areas in relation to the Moundville site (M).

Evidence of Production

To investigate Mississippian greenstone tool production in the Black Warrior Valley, I examined lithic assemblages from the Civilian Conservation Corps (CCC) excavations of the Moundville Roadway and from David DeJarnette's excavations north of Mound R and north of Mound E (Figure 2). I also consider data from site reports and from two large-scale surveys of the Black Warrior Valley (Bozeman 1982; Hammerstedt 2000; Mistovich 1987, 1988; Scarry 1995, 1998; Steponaitis 1992; Welch 1991).

The Roadway (RW) excavations were conducted in 1939 and 1940 at Moundville within a sinuous corridor, 15 m wide and 2.4 km long, that was to be disturbed by the construction of a road that now encircles portions of the plaza and areas east, west, and south of the mounds (Peebles 1971). In conjunction, several large block excavations occurred prior to the construction of an entrance building and site museum. These excavations uncovered structures, pits, and other features, the majority dating to the late Moundville I phase (AD 1050–1250) (Peebles 1971; Steponaitis 1998). I analyzed 224 greenstone artifacts from these CCC excavations, a sample that constitutes nearly 100% of the greenstone artifacts recovered from the Roadway assemblage.

David DeJarnette conducted excavations north of Mound R (NR) in 1931 and again between 1972 and 1975 (Figure 2). Recent analyses of ceramic assemblages from these and adjacent contexts have revealed a high status domestic occupation dating primarily to the late Moundville I (AD 1050–1250) and early Moundville II (AD 1250–1400) phases (Ausmus and Hawsey 2000; Scarry 1986; Steponaitis 1983). From these excavations, I analyzed 44 greenstone artifacts (Figure 2).[2]

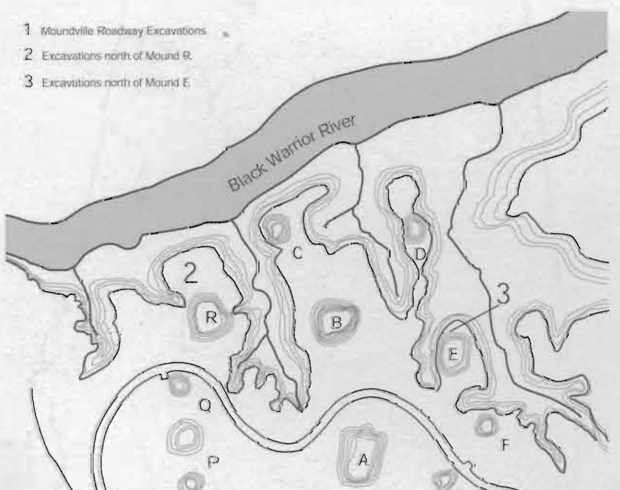

Figure 2. The Moundville site areas examined in this study.

In 1932 DeJarnette excavated the area immediately adjacent to the northern base of Mound E (NE) (Figure 2). The bulk of the recovered artifacts may derive from midden deposits from the mound summit (Knight, personal communication 2000). I analyzed the six greenstone artifacts recovered from these excavations (Peebles 1979: 254). Unfortunately, determining their precise chronological relationship is not currently possible since the associated ceramic materials remain unanalyzed.

Different recovery methods were used in these four excavations. While all dirt from DeJarnette's 1972–1975 excavations north of Mound R was screened, little or no screening took place during his 1931–1932 excavations in that location and north of Mound E, or during the CCC Roadway excavations. Lack of screening would have the effect of limiting the recovery of late-stage production refuse, including small unpolished flakes from detailed flaking and pecking activities. These excavations, however, should have recovered early-stage production refuse (rejected nodules, large unpolished flakes, blanks, and other production failures); in fact, the Roadway excavation crew piece-plotted all greenstone artifacts, including small flakes from broken and recycled celts.

Analysis of the greenstone assemblages from these three contexts (RW, NR, NE) entailed the tabulation of artifacts by tool type. Broken items were also tabulated by portion of tool present, breakage pattern, and method of recycling (if any). In all, the study assemblage consists of 274 greenstone artifacts. Among them are 249 celts—seven whole, 109 broken, and 133 broken and recycled into other tools. The remaining 25 greenstone artifacts include one spatulate celt, one broken discoidal, one miniature disc, one unfinished chisel recycled from a broken tool, one chisel recycled from a broken pendant, six sawed tablet scraps, and 14 broken tools too fragmentary to be identified.

Utilitarian Tools

All but six of the 274 greenstone artifacts in the study assemblage have polished surfaces, indicating they were once parts of finished tools. Four unpolished greenstone artifacts from the Moundville Roadway appear to be preforms recycled from broken greenstone celts. Two small unpolished flakes from the NR assemblage also appear to have derived from recycling activities.

Absent from the study assemblage are the large unpolished greenstone flakes, shatter, and rejected nodules and preforms expected as byproducts of Stage I production activities. As recently noted by Hammerstedt (2000), an absence of Stage I production refuse also characterizes Mississippian assemblages from the rural countryside of the Black Warrior Valley (see Bozeman 1982; Mistovich 1987, 1988; Scarry 1995, 1998; Steponaitis 1992; Welch 1991). This pattern strongly suggests that most Stage I greenstone production took place outside of Moundville and perhaps outside of the Black Warrior Valley altogether.[3]

This finding is not surprising considering the costs involved in transporting unworked greenstone cobbles 85 to 150 km from the Hillabee greenstone outcrops to the Moundville site.[4] Transportation costs could have been minimized by performing Stage I production activities at or near the Hillabee outcrops (Toth et al. 1992).[5] Furthermore, the absence of greenstone celt preforms and late-stage production failures in the study assemblage suggests that production Stages II and III were not conducted at the Moundville site. A note of caution is in order, however. According to my model, the quantity of production debris generated from Stages II and III is minimal compared with that of Stage I, so it is impossible to be certain that celt preforms were not transported to Moundville or lower-level Mississippian sites in the Black Warrior Valley for completion (Table 1).

Non-Utilitarian Tools

Manufacturing techniques for non-utilitarian artifacts like spatulate celts (spuds), pendants, and ceremonial celts would have differed from those of utilitarian tools. Ethnohistoric observations of Maori stone working indicate that small hammerstones would have been needed for detailed flaking and pecking tasks (Best 1974: 57). In addition, small cutting tools or "saws" would have been required for cutting greenstone slabs and creating grooves and notches. The Maori used small sandstone saws to cut narrow grooves on opposite sides of greenstone and nephrite tablets, which were eventually snapped with a sharp blow. Adding wet sand to the grooves facilitated the cutting process (Best 1974). Archaeological byproducts of these detailed flaking, pecking, and sawing activities would include numerous small exhausted hammerstones, small scraps of sawed stone, and saws or other cutting tools.

The only evidence of non-utilitarian greenstone tool production from the Moundville Roadway consists of several small hammerstones and one broken celt bit with a linear saw mark. Nine saw fragments made from hematitic sandstone were recovered from DeJarnette's NR excavations (Keeling 2000:70). Absence of hammerstones and sawed greenstone scraps, however, suggests that these saws may have been used for tasks other than the manufacture of ceremonial greenstone artifacts.[6]

These patterns contrast with the NE assemblage, which includes nine hematitic sandstone saws, 128 small exhausted chert and quartzite hammerstones, and six sawed greenstone scraps (Figures 3-4; Tables 2-3; Peebles 1979:254). One additional sawed greenstone scrap has

Table 2. Hematitic sandstone saws from Moundville, north of Mound E.

Catalog #	WPA Catalog #	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)
A932.4.172	NE 499	6.89	4.64	1.6	44.14
A932.4.173	NE 500	5.54	5.36	.33	22.69
A932.4.173	NE 500	6.0	4.49	.29	17.95
A932.4.174	NE 501	5.52	5.16	.35	20.79
A932.4.174	NE 501	9.7	5.56	.48	47.80
A932.4.175	NE 503	2.75	1.47	.36	2.85
A932.4.176	NE 504	8.8	4.41	.34	18.31
A932.4.178	NE 675	9.87	5.25	.52	54.68
A932.4.276	NE 171	5.28	3.3	.34	12.10

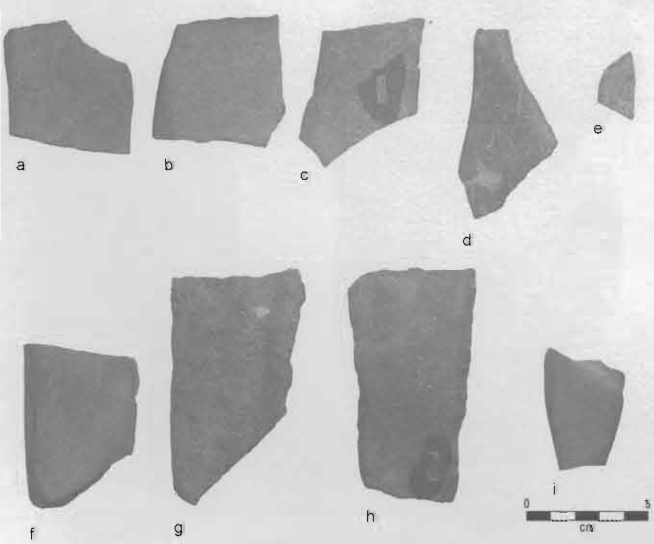

Figure 3. Hematitic sandstone saws from north of Mound E at Moundville: (a) A932.4.174; (b-c) A932.4.173; (d) A932.4.176; (e) A932.4.175; (f) A932.4.172; (g) A932.4.174; (h) A932.4.178; (i) A932.4.276.

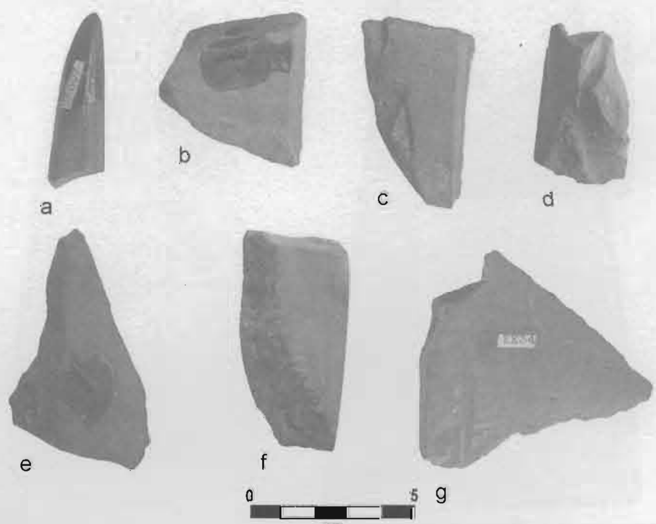

Figure 4. Sawed greenstone scraps from north of Mound E at Moundville: (a) A932.4.148; (b-e) A932.4.410; (f) A932.4.147; (g) A931.1.171.

Table 3. Sawed greenstone tablet scraps from Moundville, at the Mound E locale.

Catalog #	WPA Catalog #	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)	Comments
A931.1.171	EE 34	7.27	6.52	1.0	56.29	multiple saw marks
A932.4.147	NE 506	6.71	3.25	.75	37.39	multiple saw marks
A932.4.148	NE 507	5.53	1.64	1.49	21.68	sawed edge is ground
A932.4.410	NE 410	4.58	4.73	1.58	57.29	ground edge/cortex present
A932.4.410	NE 410	5.0	2.83	1.71	29.45	multiple saw marks/cortex present
A932.4.410	NE 410	7.88	4.49	1.53	55.92	ground edges
A932.4.410	NE 410	5.59	3.54	1.2	40.82	ground edge

been recovered immediately east of Mound E. These greenstone scraps range in thickness from 0.75 to 1.71 cm, corresponding to the thinnest and most elaborate greenstone artifacts from Moundville. The flat and thin shape of these scraps provides clues to the crafting of ceremonial greenstone artifacts at Moundville (Figure 5-6). Exceptionally thin and ornate greenstone artifacts appear to have been first pecked and ground into flat thin tablets. Hematitic sandstone saws were then used to cut out the shape of the artifact. Sandstone abraders were likely used to grind away traces of the sawing process and to polish the artifact's surfaces. As a final production step, some ceremonial items were painted with bands of hematitic slip. It is noteworthy that Vernon Knight recovered additional sawed greenstone scraps and sandstone saws from his recent excavations on the summit of Mound E (Knight, personal communication 2000). This, along with the evidence from the northern base of the mound, suggests that Mound E may have been a locus for small-scale production of ceremonial greenstone artifacts.

Evidence of Use

A functional analysis of the study assemblage provides an opportunity to examine the kinds of household activities in which greenstone tools were used, broken, and discarded during the Mississippian occupation of Moundville. Size, shape, bit angle, and breakage patterns are important characteristics to consider in assessing the function of woodworking tools (Dickson 1981). In general, large tools would have been used for heavy-duty woodworking tasks, while small tools would have been used for more detailed woodworking activities. Additional insight can be gained from examining the blades of woodworking tools. Splitting tools, such as celts or axes, have symmetrical blades. Tools used for gouging or scraping, like adzes or

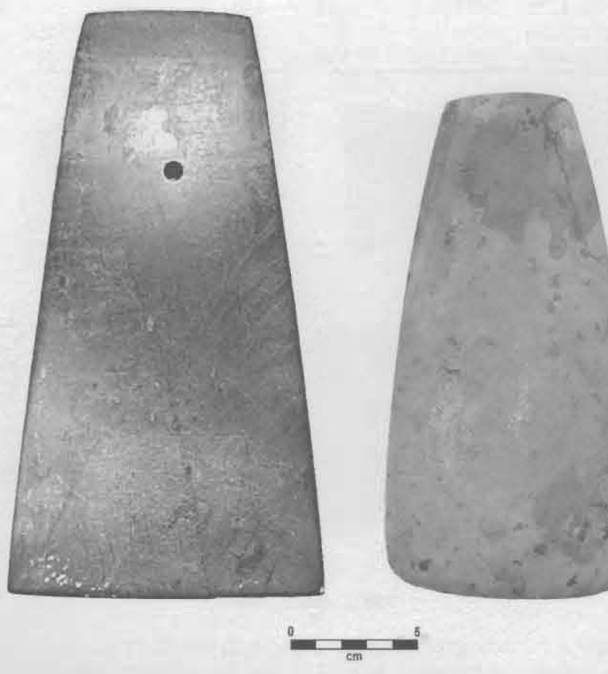

Figure 5. Ceremonial greenstone celts from Moundville.

Figure 6. Broken monolithic axe from site located six miles north of Moundville on Arthur Creek (photograph courtesy of Vernon J. Knight, Jr.).

chisels, have blades that are partially biased or beveled (Best 1974; Dickson 1981).

Analysis of greenstone assemblages from the NR, NE, and RW excavations revealed two general woodworking tool types: celts and chisels. Celts (n=246) are by far the most numerous greenstone tool type in the assemblages. These tools are rectangular or petaloid in shape with a symmetrical bit and polished surfaces.[7] Celt width generally tapers toward the poll or basal end such that the tool could be readily inserted and removed from a wooden handle (see Oakley 1982).

Three breakage patterns were identified for celts: bit fractures, midsection snaps, and poll fractures. Bit fractures and midsection snaps result from a strike in which the side of the blade (instead of the bit) hits the wood. This "side slap" creates an upwardly directed force operating against the celt where its resistance is low (Dickson 1981:78-80; Kinsella 1993). The result is either a bit fracture in which a flake is removed from the bit, or a transverse body fracture in which the celt snaps at its midsection haft (Figure 7). Poll fractures are less common and consist of flakes driven from the celt base. Such breakage probably occurred when a celt was removed from its handle and driven as a wedge with a hammerstone or wooden mallet (Kinsella 1993). Battered polls of numerous celts (n=10) in the study assemblage indicate that this was a common woodworking technique.

Based on their shape and the frequency of high-impact breakage patterns, celts were likely used for heavy-duty wood-chopping activities, such as tree felling and log splitting (Table 4). The frequency of this pattern of celt breakage in Moundville greenstone assemblages indicates that heavy-duty woodworking was a common household activity. Small courtyards and cleared activity spaces around Moundville's domestic structures were likely used for a variety of domestic woodworking tasks (Killion 1990:200). Outside of residential areas, greenstone celts would have been necessary for clearing agricultural fields, collecting building materials, and gathering firewood.

Six greenstone chisels were identified in the study assemblage. These tools range in length from 3 to 7.5 cm and have small biased bits (Figure 8). Chisel bodies often have one flat side, while the other is slightly rounded (Figure 8a). Virtually identical tools were used by the Maori of New Zealand and by the Tlingit of the northwest coast of North America (Best 1974; Emmons 1991: 172; Stewart 1984:35). In both of these cases, chisels were hafted on short wooden handles and used with a mallet to carve lines, grooves, and notches (Best 1974: 130). At Moundville, such detailed woodworking activities may have been the work of artisans capable of carving items like the elaborate wooden statuary and ceremonial masks from Spiro (Brown 1996: Figures 2-103, 2-104, 2-105).

Non-woodworking tools comprise only a small percentage of the study assemblage. One greenstone pigment-processing tool was recovered from the Moundville Roadway. Previously classified as discoidals or gaming stones, miniature greenstone discs like this are identical in shape to micaceous sandstone discs recovered from the Moundville Roadway that exhibit ground surfaces coated with crushed hematite and limonite.[8] Also recovered from the Roadway excavations is a

Table 4. Celt breakage patterns by site area at Moundville.

Provenience	Midsection Snap	Bit Fracture	Base Fracture
Dejarnette 1931 North of Mound R	14	3	-
Dejarnette 1972 North of Mound R	1	4	-
CCC 1939-1940 Roadway	38	21	1
Total	53	28	1

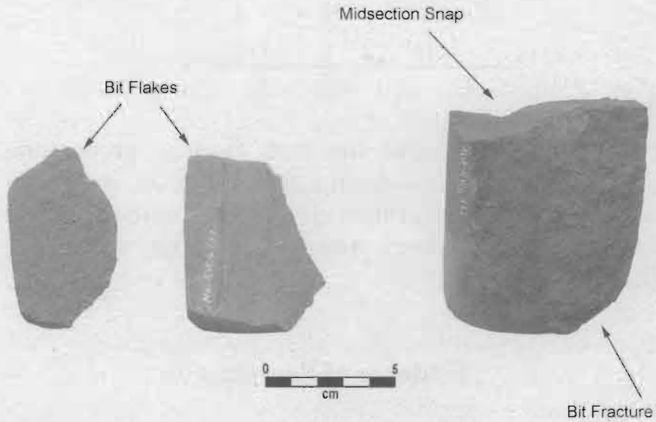

Figure 7. Utilitarian celt breakage patterns.

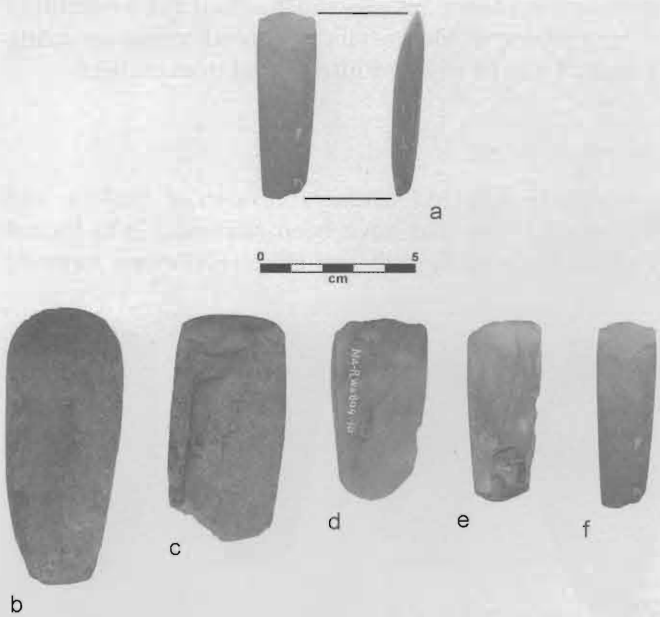

Figure 8. Mississippian greenstone chisels from various sites in the Black Warrior Valley: (a) dorsal and lateral views of a chisel from 1HAM8; (b-d) Moundville Roadway; (e) 1TU65; (f) 1HAM8.

Table 5. Preforms from greenstone tool recycling.

Tool Preforms	Count
Early Stage Celt Preforms	4
Late Stage Celt Preforms	4
Late Stage Chisel Preforms	1
Sawed Greenstone	1
Other Recycling	2
Total	12

Table 6. Expedient greenstone tools from the study assemblage (RWA, NR, NE).

Freehand Cores	48
Bipolar Cores	9
Other Cores	8
Flake Tools	49
Hammerstones	4
Total	118

broken discoidal and the poll from a greenstone spatulate celt. Considering the common mortuary association of these artifact classes at Moundville, their rarity in the Roadway assemblage is not surprising (Peebles and Kus 1977).

Evidence of Recycling

Fifty percent of the greenstone tools in the study assemblage were recycled. Systematic examination of recycling evidence reveals much about the availability of greenstone at Moundville. In broad terms, recycling activities can be divided into formal or expedient.

Formal Recycling

Formally recycled artifacts consist of broken and discarded items that have been reworked into formal tools like pendants, celts, and chisels. Nineteen formally recycled tools were identified in the study assemblage. Of these artifacts, 12 are unfinished items in various stages of the recycling process (Table 5). These include four broken celts that are early-stage celt preforms (Figure 9). All four artifacts were knapped in half longitudinally and exhibit pecking and grinding. Two of these appear to have been rejected due to difficulty in removing large flake ridges (Figure 9a, d).[9]

Four additional celts have been heavily reworked, exhibiting only traces of their original polished surfaces (Figure 10).[10] Three of these appear to be late-stage recycling rejects, as indicated by deep step fractures and multiple overshot flakes that would have made them too thin and irregular to have functioned as celts (Figure 10a-c). The other artifact is a chisel preform that displays evidence of flaking and pecking but no grinding (Figure 10d).

Four other greenstone artifacts have been modified in some fashion. Two of these are broken celts with heavy grinding on their broken surfaces; the final goal of this recycling activity is unclear. The other two artifacts exhibit minor reworking. One is a small rectangular specimen—maybe a chisel preform—thinly flaked and highly polished on all but one side. The other is a celt bit with a linear saw mark down its longitudinal axis.

Seven completed formal greenstone artifacts were recycled from other tools; six are chisels (Figure 8b-d). The smallest of these tools still exhibits part of a drill hole of the pendant from which it was recycled (Figure 11). The final recycled tool in the study assemblage is a broken, disc-shaped, pigment processing tool.

Expedient Recycling

The vast majority (n=118) of the recycled tools in the study assemblage are expedient in nature (see Parry and Kelly 1987:288). Cores are not prepared and there evidently was little emphasis on controlling the shape of the resulting flakes. Most commonly a freehand direct percussion method was employed, which entailed striking flakes from a core (usually a broken celt) held in one hand with a hammerstone held in the other

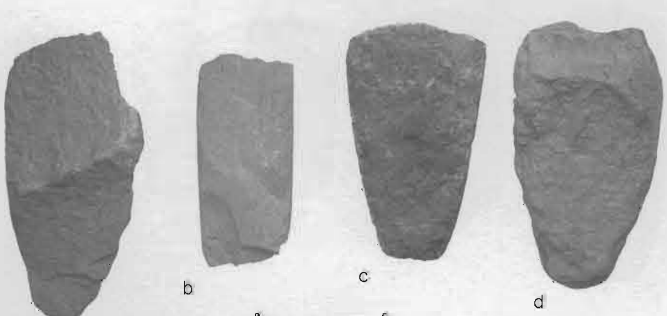

Figure 9. Early stage recycling preforms from the Moundville Roadway: (a) A939.2.470; (b) A939.2.534; (c) A939.2.528; (d) A939.2.567.

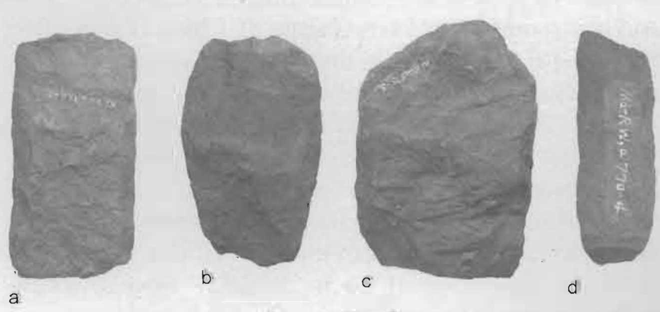

Figure 10. Late stage recycling preforms from the Moundville Roadway: (a) A939.2.555; (b) A939.2.659; (c) A939.2.642; (d) A939.2.592.

(Crabtree 1972:11). Sometimes a bipolar technique was used in which a core was set on an anvil and struck vertically with a hammerstone to drive off flakes. Informal, expedient tools were then chosen from the resulting flakes and shatter.

Both freehand and bipolar cores are represented in the study assemblage (Table 6). Two freehand cores were used as hammerstones after they had become too small to drive off additional flakes. Three other broken celts were used as hammerstones and exhibit heavily pecked surfaces. Expedient greenstone tools in the study assemblage differ greatly in size and shape. Patterns of use wear also vary; some flake tools have heavily modified edges while others are only slightly modified. Most flakes are very thin and display the ground surfaces of the original tools from which they were knapped.[11]

The function of expediently recycled greenstone tools differed from that of the formal tools from which they were manufactured. While formal greenstone tools were primarily used in woodworking activities like chopping and carving, expediently recycled tools were used in a variety of small-scale cutting and scraping tasks. Thus, the dominant method of greenstone recycling at Moundville did not replenish household woodworking tool assemblages. Rather, most recycling efforts seem to have been directed toward supplementing the production of expedient chert and quartzite flake tools at Moundville. There was no lack of knappable stone, in the form of chert and quartzite cobbles and pebbles in Tuscaloosa gravel, exposed in the streambeds of the Black Warrior Valley. Due to their small size, however, these local chert and quartzite pebbles are ill suited for the production of flake tools. Indeed, the majority of early Mississippian flake tools and cores at Moundville were manufactured of nonlocal cherts imported from the Tennessee River Valley in northern Alabama (Scarry 1995).

Discussion

This study of the Moundville greenstone industry has focused on production, use, and recycling. Based on the scarcity of production debris at Moundville and outlying sites in the Black Warrior Valley, most utilitarian greenstone tools must have been either crafted at the Hillabee outcrops in northeastern Alabama or transported to the Black Warrior Valley as late-stage preforms. Expedient recycling strategies suggest that greenstone celts were widely available to Moundville community members. Many salvageable broken tools were not recycled at all. Most of those that were recycled were knapped into expedient flake tools rather than reworked into celts or other formal woodworking tools.[12] A more formal recycling strategy (e.g., recycling large celt fragments into small celts and chisels) would be expected if access to greenstone tools had been highly restricted.

The ubiquity of utilitarian greenstone celts in domestic refuse deposits throughout the Black Warrior Valley suggests they were common household possessions. Given that celts were used in domestic woodworking tasks, their ubiquitous occurrence is not surprising. The widespread archaeological recovery of these tools suggests that Moundville community members had unrestricted access to them. Thus, while the Moundville elite may have benefited from many of these woodworking activities, they evidently did not control the material means of carrying them out.

Additional research in the vicinity of the Hillabee source areas is necessary to determine how utilitarian greenstone celt production was organized. Based on the available evidence, however, it is tempting to speculate that the greenstone production scenario was analogous to the Mill Creek hoe industry in southern Illinois. In the latter example, utilitarian agricultural tools were manufactured exclusively by Mississippian groups living at the source areas and exchanged widely throughout the greater Southeast and Midwest (Cobb 1989, 2000).[13]

It is also worth drawing the obvious comparison to the Cahokian celt making industry in the American Bottom region of southwestern Illinois. Early Mississippian groups in the American Bottom apparently transported unworked aphanitic rock some 100 km from the

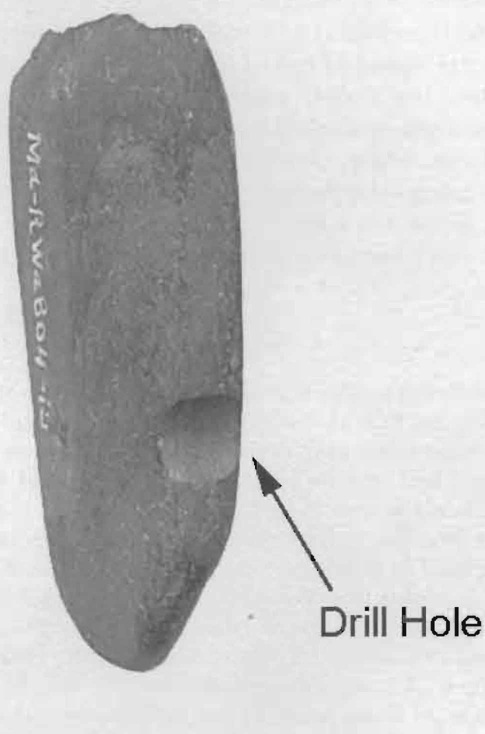

Figure 11. Greenstone pendant recycled into a chisel, A939.2.607, Moundville Roadway (1½ times actual size).

St. François Mountains in southeast Missouri for celt production. Unlike the Moundville example, there is evidence for all stages of the celt manufacturing process in the American Bottom (Pauketat 1997a:6). Moreover, these manufacturing activities appear to have been restricted to select portions of the Cahokia site (i.e., Tract 15A and the Dunham Tract) and a handful of outlying settlements, suggesting some degree of centralized control over production. Caches of unfinished celts recovered from the Cahokia, East St. Louis, and Lohmann mound centers provide additional evidence for the centralized control of this industry (Esarey and Pauketat 1992:57; Hoehr 1980:43; Moorehead 1922:31; Pauketat 1997a:6-7; Titterington 1938:7). In contrast, the absence of celt caches and production refuse in the Black Warrior Valley seems to indicate a lack of centralized control over utilitarian celt production.

Evidence for the small-scale production of non-utilitarian greenstone artifacts north of Mound E indicates that elite authority was produced and maintained through control of politically-charged material symbols. The ritual use and exchange of spatulate celts, pendants, and other ceremonial items provided the elite with a means of demonstrating their connections with the cosmologically distant and unknown.[14] Specifically, many of these artifacts are examples of ritual weaponry, affiliated with what Knight (1986:677-78) has dubbed the warfare-cosmogony complex of Mississippian *sacra*.

In this study I have demonstrated that greenstone production at Moundville was not a unitary phenomenon. The context and scale of production varied based on the intended use of the goods being manufactured. While ceremonial greenstone artifacts were manufactured and controlled by the Moundville elite, utilitarian celts were not. It is critical that we continue to explore the relationship between craft production and elite authority in the Black Warrior Valley. Future studies will help us craft a better understanding of Moundville's political economy.

Notes

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[1] These greenstone cobbles were acquired from the Hillabee Metavolcanic Complex in northeastern Alabama.

[2] The area of DeJarnette's excavations sampled for this study includes squares 110, 110 R5, 105 R10, 115, 115 R5, and 115 R10.

[3] The frequency of greenstone celts and celt fragments in the vicinity of Mound R seems to have been a factor fueling Welch's argument for a greenstone workshop. Moore (1996: 221) also noted the abundance of greenstone artifacts from Mound R, but was careful to note that they consisted of whole and broken finished tools. "Throughout the mound was the usual midden refuse and other objects, including bits of mica, a number of rough discoidal stones, hammer-stones, pebbles, hones, and a great number of fragments of polished 'celts'. These fragments, which had been broken by use and not in process of manufacture, as the high polish on parts of them show, number from forty to fifty."

[4] Gall's (1993, 1995; Gall and Steponaitis 2001) characterization studies have identified two distinct locations from which Moundville community members acquired greenstone for tool manufacture—Gale Creek in Chilton County and Hatchet Creek in Clay County, 85 and 150 km from Moundville, respectively.

[5] Producing "rough outs" or blanks at the source would have decreased carrying weight while allowing early detection of flawed cobbles. Byproducts of these activities likely would have been deposited at the Gale Creek/Hatchet Creek source areas.

[6] Knight and Steponaitis (1998) have linked sandstone saws to sandstone palette making (also Markin 1997).

[7] Hematite stains on many utilitarian celt fragments raise the possibility that some of these woodworking tools were painted.

[8] These pigment-processing tools, along with an abundance of minerals (such as hematite, limonite, and galena), were components of a household-level pigment processing industry at early Moundville.

[9] Attempts to remove these ridges are apparent from heavy pecking on the sides of both celts.

[10] One of these preforms lacked only grinding to be completed.

[11] These ground surfaces facilitated the production of flakes with sharp and stable edges capable of extended cutting and scraping activities.

[12] Most recycled salvaged tools were knapped into flakes, which were used in small-scale cutting and scraping tasks, perhaps to compensate for the small sizes of locally available cherts and quartzites.

[13] Mill Creek hoes and greenstone celts also shared similar use lives; worn down or broken implements were often used as cores for the production of expedient flake tools (see Koldehoff 1986, 1990).

[14] Peebles and Kus's (1977) mortuary analysis revealed that ceremonial greenstone celts were most commonly interred with adult men.

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