SOUTHEASTERN ARCHAEOLOGY

DISTRIBUTION AND CONTEXT OF WORKED CRYSTALLINE ARTIFACTS FROM THE MIDDLE CUMBERLAND REGION OF TENNESSEE

Michael C. Moore,[1] Kevin E. Smith,[2] Aaron Deter-Wolf,[3] and Emily L. Beahm[4]

DISTRIBUTION AND CONTEXT OF WORKED CRYSTALLINE ARTIFACTS FROM THE MIDDLE CUMBERLAND REGION OF TENNESSEE

Michael C. Moore,[1] Kevin E. Smith,[2] Aaron Deter-Wolf,[3] and Emily L. Beahm[4]

Antiquarian and modern explorations within the Middle Cumberland region of Tennessee have uncovered vast quantities of ceramic, stone, bone, and shell artifacts. Objects made from mineral resources represent a modest percentage of the overall artifact assemblage. Specimens manufactured from crystals comprise a very small portion of the mineral sample, as only six worked crystalline artifacts are documented to date for the Middle Cumberland region. These specimens of fluorite and calcite consist of four earplugs, one bird effigy pendant, and one bead from four different Mississippian period sites. Fluorite and calcite deposits occur within the study area, but additional research is needed to determine whether these sources were used to make the Middle Cumberland items. The recovery of three earplugs (two of which are very unusual) and raw calcite crystals from the Castalian Springs mound complex comprises intriguing evidence for the production of crystalline objects as a site activity.

The middle Cumberland River valley in north-central Tennessee, more commonly called the Middle Cumberland region (Moore et al. 2006:90), encompasses drainages between the confluence of the Caney Fork and Cumberland Rivers to the east and the confluence of the Red and Cumberland Rivers to the west (Figure 1). This distinct region has been the subject of extensive antiquarian and modern explorations that focused upon the abundant Mississippian period mound centers, towns, villages, hamlets, and farmsteads established along the landscape (e.g., Beahm 2012; Butler 1981; Ferguson 1972; Jones 1876; Klippel and Bass 1984; Moore 2005; Moore and Smith 2001, 2009; Moore et al. 2006; Myer 1972; Putnam 1878; Smith 1992; Smith and Moore 1994; Smith et al. 2009; Thruston 1972; Walling et al. 2000). Recent consideration of these assorted investigations by means of creative insights and ever-developing technology has led to new avenues of interpretation regarding the settlement, subsistence, warfare, iconography, and cosmology of the Middle Cumberland Mississippian populations (e.g., Beahm and Smith 2012; Clinton and Peres 2011; Dye 2009; Hodge et al. 2010; Sharp et al. 2010; Sharp et al. 2011; Smith and Beahm 2011; Smith and Miller 2009; Steponaitis et al. 2011; Worne 2011).

Archaeological investigations of Mississippian sites across the Middle Cumberland region have yielded a substantial number of clay, stone, bone, and shell artifacts. Many of these items have been examined, photographed, and reported upon in some form over the past 140 years (e.g., Brain and Phillips 1996; Cox 1985; Moore and Smith 2009; Smith 1992; Smith and Miller 2009; Thruston 1972). Mineral specimens comprise a very modest percentage of the artifact assemblages from these study area sites. However, such items occur with enough frequency to be anticipated within most site collections. Mineral artifacts previously identified in study area site collections include copper, mica, galena, graphite, and hematite (Moore and Smith 2001, 2009; Smith and Moore 1999).

The six artifacts examined here (four earplugs, one bird effigy pendant, and one bead) represent the sum total of worked crystalline specimens documented to date within the Middle Cumberland region, and all were found on Mississippian period sites (DuVall & Associates 1993; Moore and Smith 2001; Myer 1923). Visual inspection of available specimens by the Tennessee State Geologist's office determined the mineral crystals to be fluorite and calcite. Fluorite (calcium fluoride, CaF_2) or fluorspar is a relatively soft and brittle mineral (4.0 on Mohs hardness scale) that occurs as cubical crystals with octahedral cleavage, glossy luster, and a wide range of colors (Jewell 1947:22). Calcite (calcium carbonate, $CaCO_3$) has many of the same properties and colors as fluorite, although a

[1]Tennessee Division of Archaeology, 1216 Foster Avenue, Cole Building #3, Nashville, TN 37243; e-mail: mike.c.moore@tn.gov
[2]Department of Sociology and Anthropology, Middle Tennessee State University, Box 10, Murfreesboro, TN 37132; e-mail: kevin.smith@mtsu.edu
[3]Tennessee Division of Archaeology, 1216 Foster Avenue, Cole Building #3, Nashville, TN 37243; e-mail: aaron.deter-wolf@tn.gov
[4]UA-WRI Research Station, Arkansas Archeological Survey, 1 Rockefeller Drive, Morrilton, AR 72110; e-mail: beahm@uark.edu

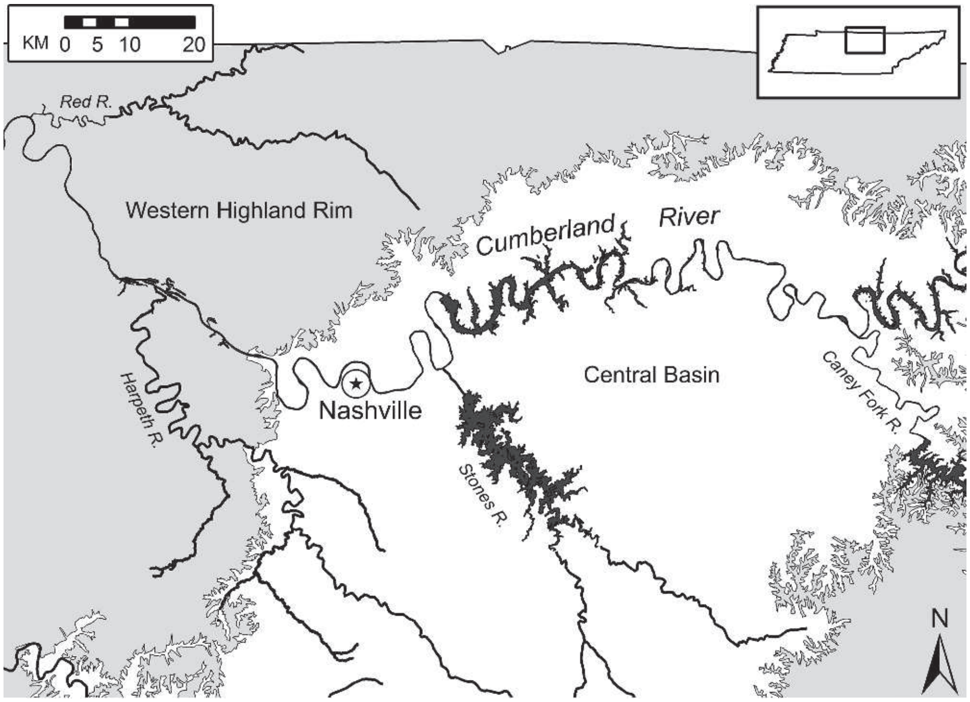

Figure 1. The Middle Cumberland region of Tennessee.

bit softer at 3.0 on Mohs hardness scale, but displays a rhombohedral cleavage (Jewell 1947:24).

While each of these crystalline objects is aesthetically appealing, their overall scarcity commands attention given the multitude of Mississippian cultural objects from the region. These crystal artifacts remain unstudied and essentially invisible in the current archaeological record, in stark contrast to the extensive documentation of other ''exotic'' Middle Cumberland Mississippian artifact resources such as marine shell and copper (e.g., Brain and Phillips 1996; Putnam 1882; Thruston 1972). This research seeks to remedy the relative anonymity of worked crystal artifacts from the Middle Cumberland region by (1) providing site provenience and accurate descriptions for documented specimens, along with some comparative discussion of crystal artifacts from adjacent regions; (2) assessing the availability of raw fluorite and calcite crystals within the Middle Cumberland region, along with possible factors that influenced the procurement of these materials; and (3) evaluating the possibility of crystal production at the Castalian Springs site.

Middle Cumberland Region Site Provenience and Artifact Descriptions

Six worked crystalline specimens comprise the focus of this study. These items were recovered from four Mississippian sites distributed across the Middle Cumberland region in Sumner, Davidson, and Williamson counties (Figure 2; Table 1). These site locations are (1) Castalian Springs, 40SU14; (2) Rutherford-Kizer, 40SU15; (3) Cheyenne Hills, 40DV195; and (4) an unrecorded location in Brentwood, Williamson County.

Castalian Springs (40SU14), Sumner County

Castalian Springs is a Mississippian mound complex established on a northern terrace of Lick Creek, a secondary tributary of the Cumberland River in southeast Sumner County. A series of investigations by William E. Myer in 1891, 1893, and 1916–17 yielded an abundance of site records and significant artifacts on which we base our current understanding of the site (Myer 1894, 1917, 1923). Myer's work included the complete excavation of an oval burial mound (Mound 1) containing 92 stone-box graves. Artifacts recovered from this earthwork include the extraordinary collection of marine shell gorgets that have generated considerable research interest over the years (Brain and Phillips 1996; Galloway 1989; Knight et al. 2001; Smith and Beahm 2011).

Myer investigated the site's dominant feature, a very large rectangular platform mound measuring 200 ft (61.0 m) long and 11 ft (3.4 m) high that was attached to the eastern side of a 22-ft (6.7-m) high, flat-topped conical mound (Mound 2). A photograph from Myer's 1923 unpublished manuscript includes a crystal earplug. He states, ''The crystal dumb-bell shaped ear ornament, of fluorite, our No. 1165, shown in Figure 142 was a surface find in the old town, in the field near

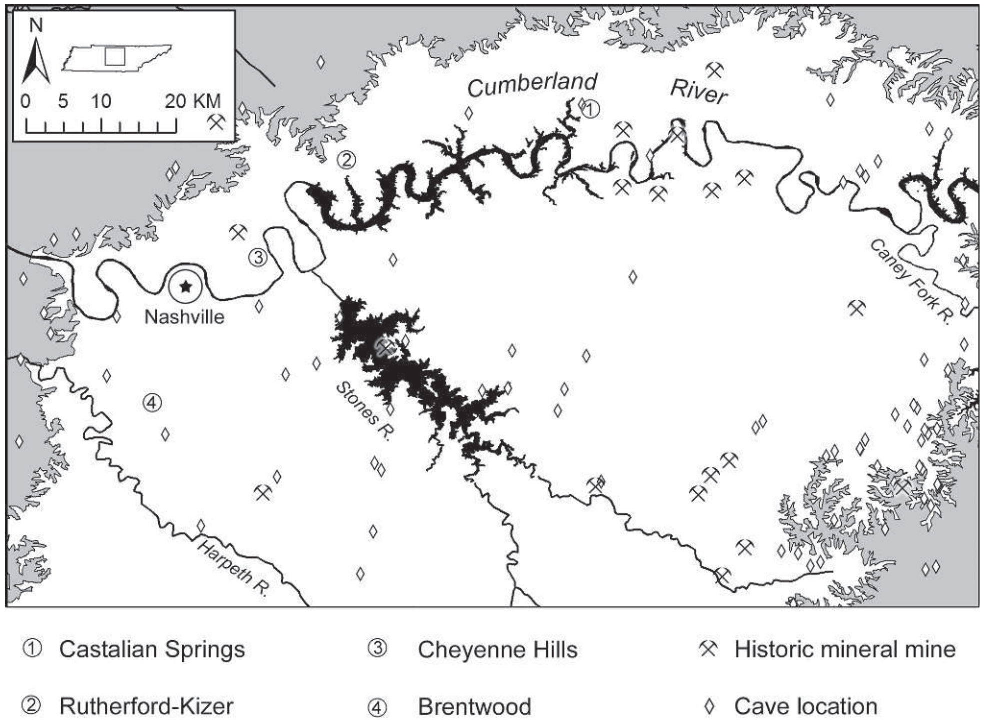

Figure 2. Site locations, mapped caves, and historic mineral mines in the Middle Cumberland region.

Mound No. 2'' (Myer 1923:461–462). This somewhat clear specimen was ground into an asymmetrical hourglass form and measures 23 mm in length and 16 mm in maximum diameter. Small grinding facets are visible along the exterior surface. Elsewhere in Myer's unpublished notes, he references the discovery of two other earplugs at the site sometime in the 1880s: ''He [Reuben Anglea] says his brother found 2 others like this about 30 years ago in this same field'' (Ball 2011).

Mound 3, described by Myer as an oval mound measuring 7 ft (2.1 m) high and about 90 ft (27.4 m) across, yielded no evidence of burials but did uncover several beds of ash. This platform mound occurs just southwest of Mound 2. A 20-m-long cross-section of Mound 3 by the 2011 Middle Tennessee State University (MTSU) archaeological field school yielded evidence for two structures on the final mound summit, structures on two earlier summits, a premound structure and midden, and a structure adjacent to the western base.[1]

During the MTSU investigations, two small calcite earplugs were recovered in the upper unit levels at opposite ends of the trench. One Mound 3 earplug is somewhat comparable in color and form to the Myer specimen but measures just half the size at 13.0 mm long and 7.4 mm wide (Figure 3A). This specimen was recovered from the plow zone directly above the floor of one of the final summit structures. The second earplug has a clear color similar to the other Castalian Springs objects but displays a completely unique form

Table 1. Worked crystal artifacts from Tennessee Cumberland River sites (measurements in mm).

Tennessee Sites	Artifact Type	Mineral	Color	Max. Length	Max. Width	Max. Diam.	Context
Middle Cumberland							
Castalian Springs	Earplug	Fluorite/calcite?	Clear	23.0	-	16	Surface, near Mound 2
Castalian Springs	Earplug	Calcite	Clear	13.0	7.4	-	Mound 3, Level 1/2; N1169E790
Castalian Springs	Earplug	Calcite	Clear	17.7	8.7	5.8[a]	Mound 3, Level 1/2; N1169E774
Castalian Springs	Earplug (2)	Fluorite/calcite?	Unknown	-	-	-	Surface?
Rutherford-Kizer	Bead	Calcite	Dk. yellow	-	5.6	9.1	Stone-box, Burial 70, 4 yrs.
Cheyenne Hills	Earplug	Calcite	Lt. yellow	20.4	13.4	-	Stone-box, Burial 19, adult
Brentwood	Pendant	Fluorite	Lt. yellow	25.4	16.6	-	Stone-box, adult
Old Town	Bead (5)	Fluorite/calcite?	Unknown	-	-	-	Stone-box
Lower Cumberland							
Bannister's Farm	Pendant[b]	Fluorite	Dk. yellow	17.0	-	12	Stone-box
Hogan	Pendant	Fluorite	Amethyst	-	-	27	Stone-box, burial 16, adult
Hogan	Pendant	Fluorite	Amethyst/white	30.0	26.0	15	Surface

[a] Tabular specimen.

[b] Peabody Museum of Archaeology and Ethnology, Harvard University.

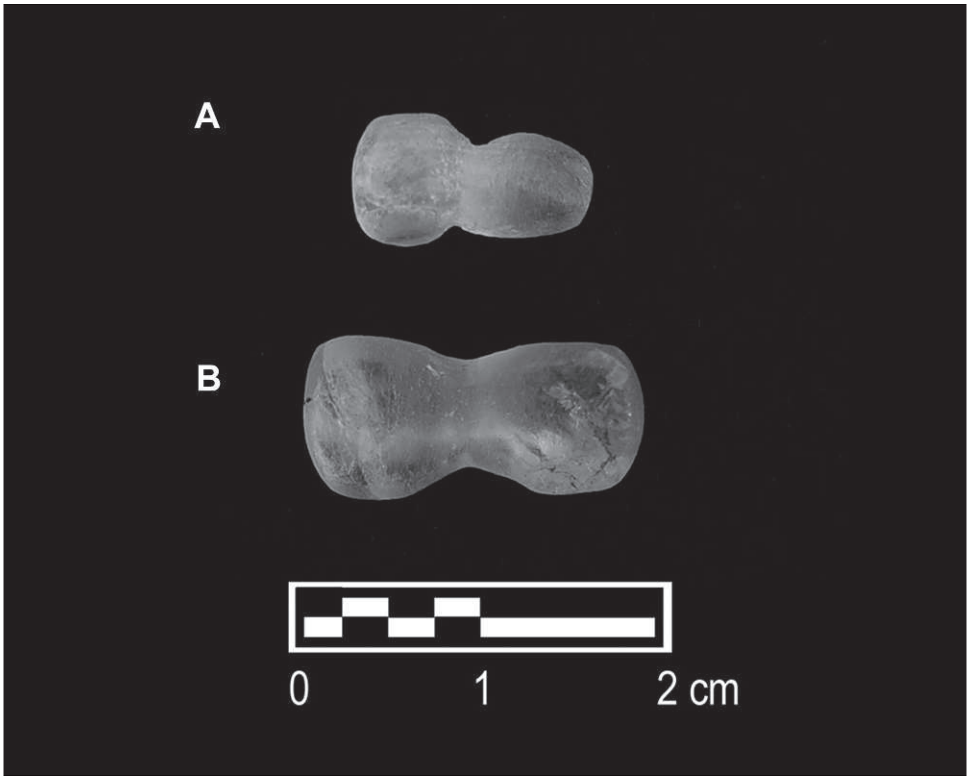

Figure 3. Crystal earplugs from Mound 3, Castalian Springs mound complex, 2011 MTSU excavations: (A) N1169 E790, Levels 1 and 2; (B) N1169 E774, Levels 1 and 2.

with an hourglass plan view and tabular profile (Figure 3B). This second item is 17.7 mm long, 8.8 mm wide, but just 5.8 mm thick. This specimen was recovered from the plow zone directly overlying the floor of another structure (designated Structure 5) that appears to be contemporaneous with active use of Mound 3.

Rutherford-Kizer (40SU15), Sumner County

The Rutherford-Kizer site was founded in southwest Sumner County along the western bank of Drakes Creek roughly five miles north of the Cumberland River. This fortified Mississippian mound center originally consisted of one large platform mound with several smaller structure and burial mounds. Edwin Curtiss explored the site on behalf of Harvard's Peabody Museum of Archaeology and Ethnology (PMAE) in December 1878 (E. Curtiss to F. W. Putnam, 7 December 1878, PMAE Accession File 79-4A). Over a 10-day period he dug 108 burials and recovered a wide variety of artifacts, including shell-tempered vessels, marine shell gorgets, and copper artifacts (E. Curtiss, Rutherford's Farm and Marshall's Farm Field Notes, December 1878, PMAE Accession File 79-4A). Additional excavations were conducted by the Tennessee Division of Archaeology (TDOA) between September 1993 and September 1995 prior to construction of a residential subdivision within the southern site area (Moore and Smith 2001).

In July 1995, TDOA personnel removed 25 graves from a stone-box cemetery just outside the palisade along the site's southeast corner (Figure 4). One small crystal bead was recovered from the previously looted and severely disturbed grave of a young child approximately four years of age (Burial 70, see Figure 4). This item was identified as calcite at the time of recovery. The bead displayed a dark yellow color and measured 9.1 mm in diameter and 5.6 mm in width (Moore and Smith 2001:112). A small hole drilled in the center measured 2.5 mm in diameter. The bead appeared round in plan view but had a rather chunky profile with a sharp (almost 90-degree) angle created by the transition from the flattened surfaces and lateral edges. Numerous grinding facets were present along the exterior surface. This bead was reburied on site with the removed skeletal remains and other associated burial objects in accordance with Tennessee state law (Moore and Smith 2001:6).

Cheyenne Hills (40DV195), Davidson County

The Cheyenne Hills site consists of a Mississippian stone-box cemetery on a low bluff overlooking the

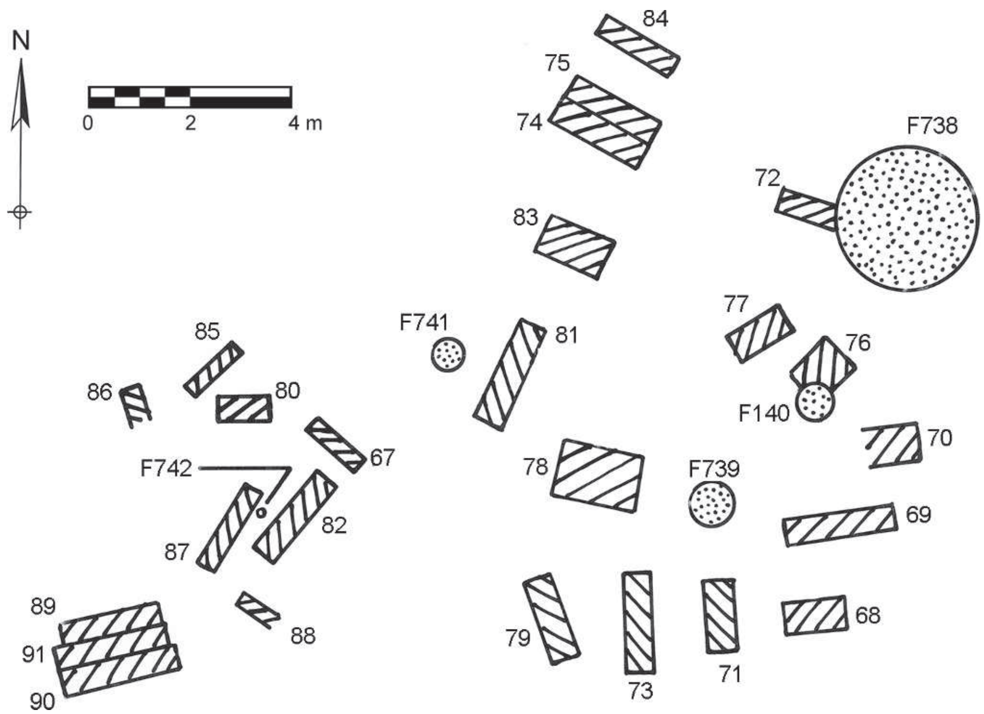

Figure 4. Plan map of Rutherford Kizer stone-box cemetery with vandalized Burial 70 (from Moore and Smith 2001:43).

Cumberland River floodplain in northeast Davidson County (DuVall & Associates 1993). Twenty-six graves were identified and removed in July 1992 by a private consulting firm prior to construction of a residential subdivision (Figure 5). Burial 19 contained the disturbed remains of an adult of unknown age and sex, as well as a complete crystal earplug under a side-stone that had tilted inward (Figure 6A).

The consultant referred to this artifact as quartz crystal (DuVall & Associates 1993:25), but a subsequent examination revealed the mineral source to be calcite. This translucent specimen exhibits just a hint of yellow color and a somewhat symmetrical hourglass shape. Small grinding facets are present along the exterior surface. The earplug measures 20.4 mm long and 13.4 mm in maximum width. The central constriction has a maximum diameter of 9.1 mm.

Brentwood, Williamson County

The City of Brentwood is located in north-central Williamson County near the Davidson County border. Grading activity on a Brentwood hilltop around 1980 exposed a Mississippian stone-box burial. Mr. John Dowd, recipient of the 2012 Crabtree Award from the Society for American Archaeology, went to the construction area to investigate the discovery. Dowd observed a single adult stone-box grave already dug by looters. A follow-up examination of the disturbed coffin recovered a crystal pendant (Figure 6B) from one of the grave corners (John Dowd, personal communication, 2010).[2]

This pendant, presently in a private collection, was examined by the authors and determined to be a bird effigy of light yellow fluorite that displays a prominent beak, breast/abdomen, and tail feathers. The head is plain but exhibits a drilled hole in place of the eyes. Two legs extend from the pendant base, one slightly longer than the other. The tail feathers angle outward away from the body. The exterior surface shows the same grinding facets observed on previously described artifacts. In addition, select artistic details around the beak, tail feathers, and legs appear cut as well as ground. This artifact measures 25.4 mm high, 16.6 mm wide, and 17.0 mm thick. The drilled eye holes have a maximum diameter of 4.6 mm, and the tail measures 13.0 mm wide. The longer leg measures 2.5 mm in length.

Other Possible Specimens from the Middle Cumberland Region

William Clark's nineteenth-century account of his Middle Tennessee explorations included a brief discussion of the Old Town site (40WM2), a fortified Mississippian mound center and cemetery on the Harpeth River in northern Williamson County (Clark 1878). Of interest to this research is his reference to ''five beautiful oblong beads of amber'' found in a stone-box grave (Clark 1878:275). He described these beads as ''two inches long, and in the center one-half

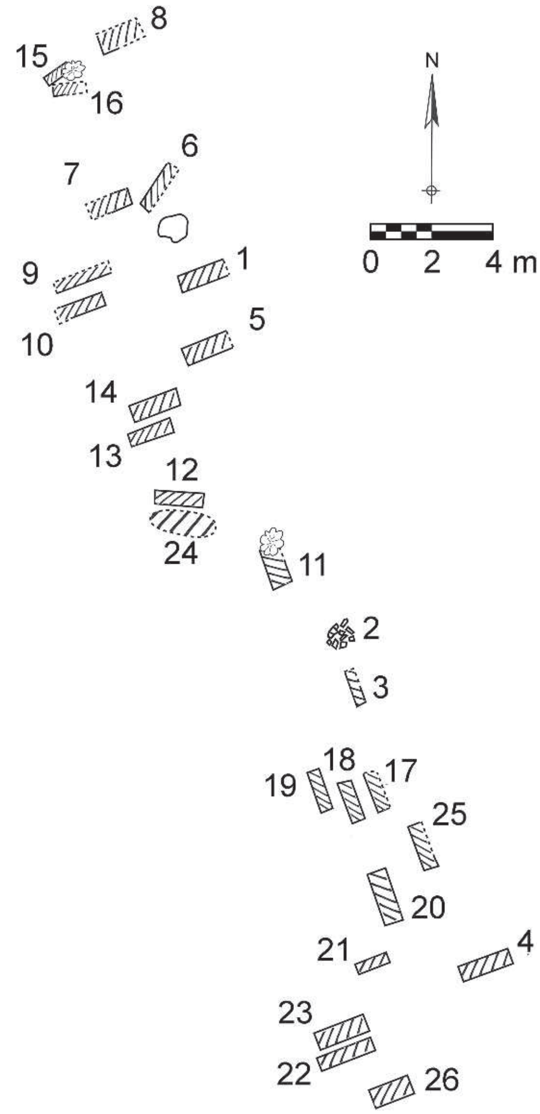

Figure 5. Plan map of 40DV195 stone-box cemetery with Burial 19 (redrafted from DuVall & Associates 1993:Figure 3).

inch in diameter … smoothly bored … though showing some cracks were still entire … showed a fine polish … and would have been prized by our ladies very highly'' (Clark 1878:275). The authors suggest these beads were not made of amber but of fluorite or calcite.[3] Edwin Curtiss made a similar error by describing the fluorite pendant he recovered from Bannister's Farm in Stewart County as made of amber (Moore and Smith 2009:101, 308).

Worked Crystal Artifacts Adjacent to the Middle Cumberland Region

Lower Cumberland Region of Tennessee

Explorations by Edwin Curtiss on behalf of Harvard's Peabody Museum during April 1879 concentrated on sites along the lower Cumberland River in Stewart County, Tennessee (Moore and Smith 2009). Bannister's Farm represents a Mississippian mound site located on Dyer Creek near its confluence with the Cumberland River, roughly 50 km west of the Middle Cumberland region boundary.[4] Curtiss dug 26 stone-box graves from the northeastern corner of a mound of unknown dimensions and shape (Moore and Smith 2009:160). Grave 24 contained the fragmentary remains of a child as well as a crystal pendant (Moore and Smith 2009:161). A review of the Peabody Museum Collections online system shows this dark yellow specimen has a spherical body with a suspension loop. Curtiss described this artifact as an ''amber nose drop'' in his field notes (E. Curtiss, Excavation Notes for Sites on Cumberland River, Stewart Co, PMAE Accession File 79-4), but the Peabody Museum catalog sheet logged this item as fluorspar (PMAE Collections Online, PM 79-4-10/18352). Online measurements note a maximum length of 17 mm and body diameter of 12 mm (see Table 1).

Two fluorite artifacts were reported from the Hogan site (40SW24), located near the town of Dover approximately 40 km downstream from the Middle Cumberland region boundary (see Table 1). This large Mississippian period village and stone-box cemetery overlooked the northern bank of the Cumberland River. Our best site information comes from the 1962 University of Tennessee site exploration prior to the creation of Lake Barkley that included the removal of 20 Mississippian stone-box graves (Morse 1963). Burial 16 contained an (apparent) adult female with

> *a scalloped amethyst-colored fluorspar pendant … varies between 2.6 and 2.7 cm in diameter. A central biconical perforation is 7 mm in diameter. Each of the eight evenly arranged scallops around the outer edge is 7 mm wide and 3 mm high. A 3 mm in diameter perforation had been drilled into the center of one scallop from each side for suspension. (Morse 1963:127)*

The second Hogan specimen, collected by an area resident from the site surface, was described by Morse (1963:119) as

> *a broken translucent mottled purple and white fluorspar pendant which measures 2.6 cm wide, 1.5 cm thick, and probably was originally 3 cm long. It is a human head effigy and is flattened on the back. The nose is prominent, the upper mouth represented by a line below which is broken off. The eyes are in relief and have pupils. The ears are knobs. The forehead has wrinkles and the top of the head seems to be a stylized headdress. …The original hole had worn through on top, was smoothed over, and a new perforation made immediately below it.*

Lower Ohio River Region

The vast majority of worked fluorite artifacts adjacent to the Middle Cumberland region study area

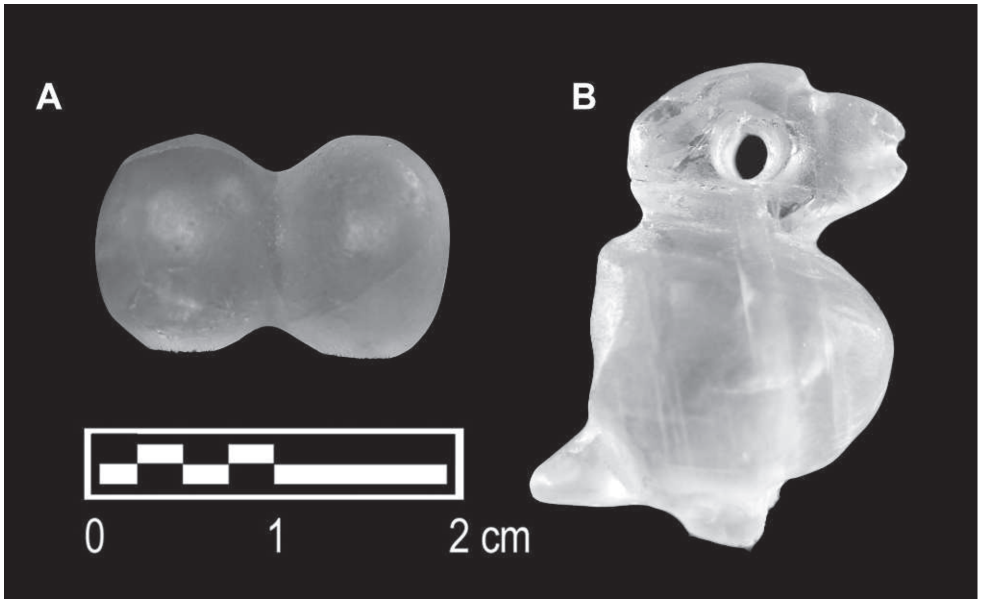

Figure 6. (A) calcite earplug from Burial 19, Cheyenne Hills, 40DV195; (B) fluorite bird effigy pendant from stone-box grave, Brentwood, Williamson County, Tennessee.

derive from the lower Ohio River region of southern Illinois, western Kentucky, and southern Indiana (e.g., Black 1967; Boles 2011, 2012; Cole et al. 1951; Muller 1986a). This result is not surprising given the rich fluorite deposits within the region (Kentucky Geological Survey 2008; Reinertsen and Masters 2010).

The most spectacular of these fluorite items are arguably the carved human figurines. Perhaps the best-known object is the ''Adonis of Newburgh'' or ''Little Green Man'' figurine from the Angel site in southwestern Indiana (Black 1967; Schilling and Baumann 2012; Wolforth and Wolforth 2000). This male figurine, measuring 23.5 cm in height, was carved from a single piece of yellow fluorite and discovered in Mound F fill by a 1940 WPA crew. Four comparable male fluorite figurines are known from adjacent locations, including the Anna and Cahokia figures from southern Illinois, the Tolu figure from western Kentucky, and the Obion figure from northwestern Tennessee (Boles 2011, 2012; Bostrom 2007; Garland 1992; Wolforth and Wolforth 2000). Yet another figurine fragment of unknown sex known as the MNH Head has been reported from an unspecified site in southern Illinois (Emerson 1982). These figurines have been interpreted as temple statuary and ancestral figures from which a group claimed descent (Smith and Miller 2009; Wolforth and Wolforth 2000). Interestingly, these statues of fluorite are very similar to statues of stone and wood recovered from the Tennessee–Cumberland River drainages (Smith and Miller 2009).

Additional fluorite specimens uncovered at Angel include owl effigy pendants, cylindrical pendants, and beads (Black 1967:445; Schilling and Baumann 2012). Past research at the Kincaid site has recovered ear/lip plugs, beads, and a human head effigy pendant (Boles 2012:85; Cole et al. 1951:Plate 25A&B; Kincaid Mounds Support Organization 2012; Schwegman 2011).

Recent research has considerably expanded the breadth of fluorite artifact types represented at prehistoric sites across the lower Ohio River valley (Boles 2011, 2012). Documented specimens exhibit a diverse range of ear/lip plug, bead, pendant, owl effigy pendant, and human effigy pendant styles. These items include a representative sample of earplugs recorded from sites in Crittenden, Ballard, and Hickman Counties, Kentucky (Boles 2011:246–247). The dominant earplug form was made of (primarily purple) fluorite and displayed a ''mushroom'' appearance with a cylindrical body and one flared end (Figure 7). A few of the ''mushroom'' specimens were made of yellow and white/translucent fluorite. Several hourglass-shaped earplugs of purple and yellow fluorite were also present.

Comparative Observations

Some general observations are worth noting about the characteristics of Middle Cumberland region artifacts recorded to date, and how they contrast with comparable specimens from these adjacent regions. For example, artifacts from the Middle Cumberland region are clear to yellow in color, with purple noticeably absent (see Table 1). A second observation is there appears to be regional differences in select artifact forms. Owls comprise the dominant fluorite bird effigy

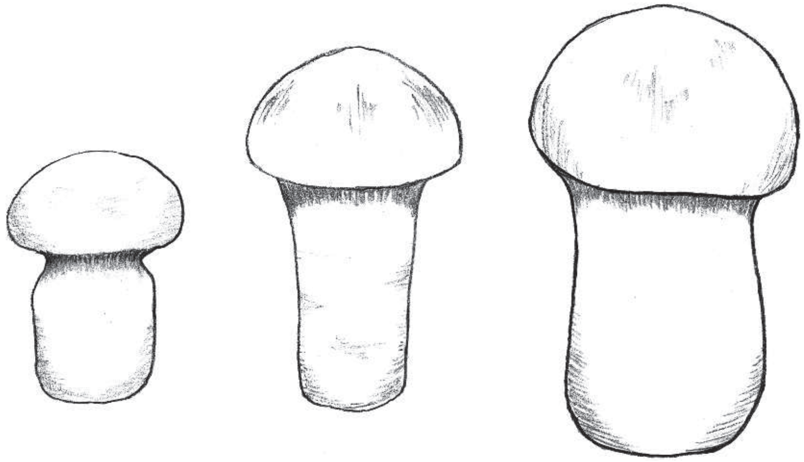

Figure 7. Fluorite earplugs from southwest Kentucky that represent a primary earplug form from the lower Ohio River valley. Redrafted from Boles (2011:246).

from lower Ohio River region sites (Boles 2012). These figures are easily identified as owls by their ear tufts and/or distinctive pointed beaks, while other traits (flat to prominent breast/abdomen, presence of tail feathers and wings) appear variable. The Brentwood bird effigy pendant in Figure 6B is clearly not an owl as it exhibits a very different form (songbird?). This specimen lacks ear tufts, displays a prominent upper and lower beak, and has tail feathers that angle away from the body. Finally, the hourglass-shaped earplugs from Castalian Springs and Cheyenne Hills represent a minor crystal earplug form when compared to examples from the lower Ohio River region (Boles 2011, 2012; Schwegman 2011). As previously mentioned, the primary lower Ohio River form is mushroom shaped with a cylindrical body and one flared end ranging from triangular to round (see Figure 7).

Fluorite and Calcite Resources in the Middle Cumberland Region

The Illinois-Kentucky Fluorspar District of southeastern Illinois and western Kentucky, located about 150 km northwest of the Middle Cumberland region, is widely recognized as the premier fluorite deposit in the country (Kentucky Geological Survey 2008; Reinertsen and Masters 2010). About three-quarters of all fluorite mined in the United States between the late nineteenth and mid-twentieth centuries originated from this locale. But by the 1990s fluorite mining had ended due to competition and cheaper imports from foreign producers. Notable fluorite deposits are also known for many of the far western states as well as select midwestern and eastern states (Batty et al. 1947; Boyer et al. 1997; Minerals Zone 2005).

Of significance for this study is that fluorite and calcite deposits are also present within Middle Tennessee, and specifically in the Middle Cumberland region (Floyd 1965; Jewell 1947). Much of the region occupies the Central Basin physiographic province, an elliptical depression characterized by gently rolling to hilly terrain and meandering streams (Miller 1974; see Figure 1). The Central Basin (and transition zone with the adjacent Eastern Highland Rim physiographic province) is underlain by deep deposits of Ordovician limestone with shear faults and fissures that serve as locations for mineral veins. These veins are generally vertical, range from a few inches to about 6 ft in width, and tend to be located in the northern half of the Central Basin (Floyd 1965:51; Jewell 1947:18). This northern half of the Central Basin coincides with the Middle Cumberland region and is immediately adjacent to the Central Tennessee Ba-F-Pb-Zn District, which lies within the Eastern Highland Rim (Mindat.org 2013).

Mineral veins within the region are composed primarily of barite (barium sulfate) and fluorite, along with variable percentages of other minerals, including calcite, galena (lead sulfide), and sphalerite (zinc sulfide). Fluorite within the study area occurs as well-formed but irregular grains or masses that are generally white or yellow in color (Floyd 1965:51–53; Jewell 1947:22–23). Small amounts of purple fluorite are present along cracks or cavity linings. Calcite from the region is described as coarsely crystalline but well formed (Jewell 1947:24). The color is generally translucent to white, but shades of other colors are also possible (notably yellow, brown, and purple).

Figure 2 notes that modern mines with mineral crystals occur in the general vicinity of all four Mississippian sites that yielded crystalline artifacts (Hardeman and Miller 1959). Such mines are notably present just east of the Castalian Springs site and include the renowned Elmwood and Gordonsville mines in Smith County along the Highland Rim boundary (Seal et al. 1985). However, the important issue to consider is whether local Mississippian period residents could access the fluorite and calcite crystals, as these mineral veins are reported to extend 60 m or more below ground surface (Jewell 1947:18). The Tennessee State Geologist's office states the larger fluorite and calcite crystals from modern mines come from deposits too deep to access without heavy equipment (Michael Hoyal, personal communication, 2011).

There is no evidence to suggest indigenous residents were surface mining these materials, as no ancient crystal quarry or surface spoil sites have been recorded within the Middle Cumberland region. Exposed mineral veins have been noted in select surface locations such as creek beds, weathered bluffs, and eroded hills; and fluorite and calcite crystals can be found in stream gravels and geodes (Jewell 1947). However, these sources yield crystals that are fractured, too small to work, or what has been described as ''gravel'' spar (Jewell 1947:20).

A possibility to consider is that fluorite and calcite crystals were recovered from local caves. The karst topography of the outer Central Basin and surrounding Highland Rim physiographic provinces results in numerous caves and sinkholes throughout the Middle Cumberland region. Of 863 karst features recorded in the Central Basin, the highest concentration of passable caves is located southeast of Nashville along the Eastern Highland Rim escarpment (Shofner et al. 2001; Tennessee Division of Natural Areas 2013). Figure 2 notes the presence of several caves in the immediate vicinity of modern mineral mines.

Prehistoric cave mining for such materials as chert, gypsum, selenite, epsomite, mirabilite, satinspar, and salt has been documented north of the study area in Indiana and Kentucky (see summaries by Barrier and Byrd [2008] and Crothers et. al [2002]). Wyandotte Cave in southern Indiana was exploited for aragonite, epsomite, and chert during the Late Archaic through Middle Woodland periods (Munson and Munson 1990). In Kentucky, Indian Salts Cave and the Mammoth Cave system contain evidence of Woodland period mineral extraction (e.g., Barrier and Byrd 2008; Crothers et. al 2002; Munson et al. 1989; Tankersly 1996; Watson 1974).

Direct evidence of prehistoric cave mining in Tennessee has been documented at three sites to date. Big Bone Cave and Hubbards Cave are situated along the intersection of the Eastern Highland Rim and Cumberland Plateau physiographic provinces in southeastern Middle Tennessee adjacent to the Middle Cumberland region. Prehistoric mining for gypsum and selenite at Big Bone Cave occurred during the Early Woodland period (Crothers 2001), while dates from Hubbards Cave point to mineral extraction during the Middle Woodland period (Pritchard 2008). Third Unnamed Cave, located east of the study area on the upper Cumberland Plateau, has yielded evidence of Terminal Archaic period chert mining (Franklin 2001, 2008).

Caves throughout Tennessee and the interior Southeast continued to be explored, decorated, and used as burial locations throughout the Mississippian period (e.g., Cressler 1999; Douglas et al. 2008; Faulkner 1998; Faulkner et al. 1984; Simek and Cressler 2008). The indirect association of radiocarbon dates with excavated pits at several sites suggests clay mining occurred in some caves during late prehistoric times (Faulkner and Simek 2001; Simek et al. 2001). However, there is no direct evidence to date of Mississippian period mineral extraction from caves in these areas.

If Mississippian inhabitants of the Middle Cumberland region were indeed mining fluorite and calcite from caves, they may have done so using similar technology and techniques associated with Woodland period mineral extraction. Obtaining selenite, which forms as individual crystals in dry, sulfate-rich alluvial settings, required the excavation of cave sediments using tools such as digging sticks and bivalve shells (Munson et al. 1989). Although fluorite and calcite crystals form in faults and fissures, these minerals could occur within cave sediment as a result of infill and ceiling breakdown. Artifacts recovered from Salts and Mammoth Cave show gypsum and satinspar were dislodged through battering with expedient hammerstones (Crothers et al. 2002; Munsen et al. 1989). Fluorite and calcite crystals potentially exposed in fissures or on cave walls would likely not be collected using these same techniques. These minerals would have been extracted more carefully, perhaps using stone chisels, in an effort to collect sound parent material. Since these crystals have very similar properties (including hardness and color), it is unlikely that one resource would have been intentionally selected over the other.

Social Context

The Rutherford-Kizer, Cheyenne Hills, and Brentwood crystal artifacts comprise mortuary goods recovered from Mississippian stone-box graves. The Cheyenne Hills earplug and Brentwood bird effigy pendant were associated with adults (age and sex unknown), and the Rutherford-Kizer bead was recovered from the disturbed burial of a four-year-old child. While these three artifacts are conclusively associated funerary objects, there appears to be something different happening at the Castalian Springs site. None of the three earplugs derive from a mortuary setting. The Myer earplug was a surface find and could have conceivably been associated with a burial, but the other two specimens were tiny objects apparently deriving from the disturbed floors of two structures associated with Mound 3.

Artifacts fashioned from fluorite and calcite may have functioned as markers of elevated social status or held ritual significance, or both, by the later portion of the Archaic period in the Midcontinent. This is shown by the association of calcite beads with mortuary activity (Nolan and Fishel 2009; Perino 1968; Wiant et al. 2009) and the circulation of fluorite artifacts through Archaic trade networks stretching from Illinois to northern Louisiana and Florida (e.g., Boles 2012; Lien et al. 1974; Webb 1968). Both worked and unworked crystalline artifacts have also been recovered from Woodland period contexts (Boles 2012; Cowan and Greber 2002; Fortier 2001; Fortier et al. 1989), where they appear to have had ''mostly non-utilitarian functions'' (Fortier 2008:29).

During the Mississippian period, worked and unworked fluorite/calcite crystals are recovered alongside other exotic and prestige goods, including quartz crystals, marine shell, hematite, copper, mica, tobacco pipes, and flint clay figurines. This suite of material is associated with elite burials and residences and mound activity at Cahokia and other sites throughout the middle Mississippi and lower Ohio valleys (Baltus and Baires 2012; Pauketat 1998a, 1998b; Pauketat and Koldehoff 2002; Pickering and Rackerby 2004 Strezewski 2003; Trubitt 1996). The recovery of fluorite beads at houses throughout the area surrounding Kincaid (Muller 1986b, 1987), and of failed fluorite beads alongside evidence of shell bead manufacture in a house on the Fingerhut Tract at Cahokia (Koldehoff 1995), suggests that crystalline artifacts were created and distributed through the same networks responsible for the dissemination of other exotic and prestige goods.

Beads, plummets, ear plugs, and other items of personal adornment crafted from calcite and fluorite likely served as indicators of individual standing in Mississippian society, while the previously described crystalline figurines carried iconographic significance. However, the raw material from which these artifacts were manufactured was also imbued with ritual and social value. The recovery of raw and lightly worked fluorite, calcite, quartz, and plagioclase crystals from sites including Cahokia (e.g., Pauketat et al. 2002, Pauketat and Koldehoff 2002), BBB Motor Works (Emerson 1995), Emmons Cemetery (Morse et al. 1961), and Dickson Mounds (Strezewski 2003) suggest that crystals played an important, albeit poorly defined, role in Mississippian ritual life in the Middle Mississippi Valley (Emerson 1989, 1995).

Similar raw material significance has been attributed to marine shell artifacts from the Mississippian period. Marine shells were conceptualized as the scales of the Great Serpent, alternately manifested as the Underwater Panther, the Horned Water Serpent, or the Piasa (Lankford 2007a). Artifacts manufactured from these materials thereby carried innate symbolism extending beyond their ability to signal individual status or function as a canvas for the display of iconographic symbols. Instead, marine shell artifacts served as ritual locatives invoking both the Great Serpent and the Beneath World of the layered Mississippian cosmos (Deter-Wolf and Peres 2014; Lankford 2007b). In this same manner, ethnographic and ethnohistorical data suggest that calcite, fluorite, and other crystals recovered from Mississippian contexts were intimately associated with the Great Serpent (see also the discussions in Emerson [1997] and Hudson [1976]).

The Cherokee and Creek conceptualized crystals as scales of Uktena, the Horned Serpent (Hudson 1976; Mooney 1900). Uktena's forehead also bore a large, red-tinted crystal called *Ulûñsû'tî* (''transparent,'' Mooney 1900:297) that was believed to be particularly potent (Hudson 1976; Mooney 1900). Both individual scales and fragments of the *Ulûñsû'tî* could be procured from caves or through confrontation with Uktena. These relics acted as conduits of the Horned Serpent's power and bestowed their bearer with the ability to harness and direct supernatural energy. Consequently, crystals were important elements of a shaman's ritual paraphernalia and were used for divination and protection from malevolent forces (Gilbert 1943; Hudson 1976; Mooney 1900). Among the historic Cherokee, Creek, and Seminole, crystals were also carried by adult men as a form of personal medicine to ensure success in hunting and procreation (Hudson 1976; Mooney 1900). According to Mooney (1900), powerful crystals were buried with their owners. Although the crystals described above are likely quartz rather than fluorite or calcite, it is not unreasonable to assume shared significance between crystalline minerals.

A Consideration of Crystal Production at the Castalian Springs Mound Center

An interesting outcome from the 2005–11 MTSU field school excavations at Castalian Springs is the recovery of numerous raw calcite crystals. Ongoing water-screen processing of soil samples has retrieved these crystals from select excavation units across the site area (Table 2). Figure 8 clearly indicates that certain site locations contain more raw calcite crystals than others, namely, Mound 3, the area east/southeast of Mound 1, and the southern site area. This distribution, along with the three earplugs that represent 75 percent of the known earplug sample from the study area, raises the question of whether the earplugs were manufactured at

Table 2. Raw calcite crystals from 2005–11 MTSU excavations at Castalian Springs (measurements in mm).

Catalog No.	North	East	Level	Max. Length	Max. Width	Max. Thick	Comments
05-01-014[a]	1006	998	2	10.7	7.5	6.3	Clear color
05-01-015[a]	1006	998	3/4	16.7	14.8	9.3	Clear color
05-01-021[a]	1000	982	5	30.8	20.4	12.9	Light purple color
05-01-027[a]	1000	982	5	19.0	11.2	6.0	Clear/light purple color
05-01-057[a]	1000	998	6	18.7	14.3	10.4	Clear color
06-26-008	1020	938	2	7.0	6.6	2.8	Clear color
06-26-012	1020	964	2	13.8	12.5	6.9	Clear color
06-26-030	1020	936	5	19.6	11.5	8.2	Clear color
06-26-033	1020	938	5	19.4	17.8	10.6	Clear color
06-26-054	1038	972	1	14.1	10.5	7.2	Clear/smoky color; 1 of 2 specimens
06-26-054	1038	972	1	11.6	6.8	4.4	Clear color; 2 of 2 specimens
06-26-092	1020	966	1	13.3	12.3	7.0	Clear color; 1 of 3 specimens
06-26-092	1020	966	1	13.2	8.3	5.3	Clear color; 2 of 3 specimens
06-26-092	1020	966	1	11.0	9.5	4.3	Clear color; 3 of 3 specimens
06-26-093	1020	968	1	11.3	7.4	7.8	Clear color
06-26-148	1036	970	2	11.5	8.5	9.2	Clear color; Str. 1 wall trench (F20)
07-07-012	1034	984	2	13.7	8.9	5.1	Clear color
07-07-012	1034	984	2	10.1	8.3	8.0	Clear color
08-21-144	1110	702	2	12.1	8.9	9.2	Clear color; ground edges
11-04-156	1165	792	2	8.8	7.2	2.8	Clear color
11-04-160	1167	792	2	8.1	7.0	4.7	Yellow color

[a] These artifacts from 2005 test units (south of Hwy. 25) using different grid system than 2006–11 work.

the Castalian Springs site. Along with that prospect would be the presence of one or more crystal ''workshops'' or ''crafting locales'' as defined by Boles (2012:72). These possibilities deserve additional scrutiny as the 2005–11 water-screen samples continue to be processed and tabulated.

Crystal (fluorite) production has been defined as an activity at several sites in the lower Ohio River region, including Kincaid Mounds in southern Illinois and Angel Mounds in southwest Indiana (Boles 2012; Schilling and Baumann 2012). Documentation of crystal (calcite) production at Castalian Springs would be the first of its kind within the Middle Cumberland region. Past site excavations across the study area have yielded the occasional quartz crystal or galena cube, but no raw calcite/fluorite crystals, and certainly not in the quantity discovered at Castalian Springs (Moore and Smith 2009; Smith and Moore 1999).

Twenty of the 21 calcite specimens retrieved to date comprise raw crystals that do not show any obvious evidence of alteration such as grinding or cutting actions (Figure 9A; see Table 2). One crystal does display evidence of grinding along the lateral edges, but it is not a finished product. Of the 20 unworked crystals, just one has the sufficient mass to produce an earplug of the size found by Myer. However, five are large enough to fabricate the (N1169/E790) earplug from Mound 3, and 11 are big enough to make the second (N1169/E774) Mound 3 earplug. The remaining specimens could be used to make smaller items such as beads. Several tiny and irregular crystals may represent debris from initial manufacturing processes. A speculative progression of crystal production at Castalian Springs, from parent material to finished product, is presented in Figure 9B.

Considerations for Future Research

This research has documented six worked crystal specimens for the Middle Cumberland region as well as the recovery of calcite crystals from the Castalian Springs site area. These items were identified through a review of the Tennessee site information files, interviews with local informants, and examinations of private collections. Other such artifacts may be revealed through vigilant searches of additional local, state, and perhaps national repositories.

Sourcing studies should be pursued to evaluate whether the Middle Cumberland artifacts derive from locally available crystals or nonlocal sources such as the Illinois-Kentucky Fluorspar District. Analysis methods including x-ray fluorescence, neutron activation, and mass spectrometry may successfully yield unique source signatures. Field recovery of local mineral crystals will be necessary to gather baseline data and should include surveys of Middle Cumberland region caves, sinkholes, and mines. Such surveys should focus upon the vicinity of the Castalian Springs site to identify potential sources for the calcite crystals recovered to date.

Finally, the recovery of raw calcite crystals at Castalian Springs has brought to light the possibility of a site activity (crystal production) unique to the Middle Cumberland region. Fluorite crystal production in the lower Ohio River region has been suggested to occur primarily at mound centers based upon the presence of recorded worked and unworked pieces (Boles 2012). Boles (2012:72) uses ''workshop'' and ''crafting locale'' to characterize these production locations, where a workshop is ''a locale where craft production is evident and the level of such activity

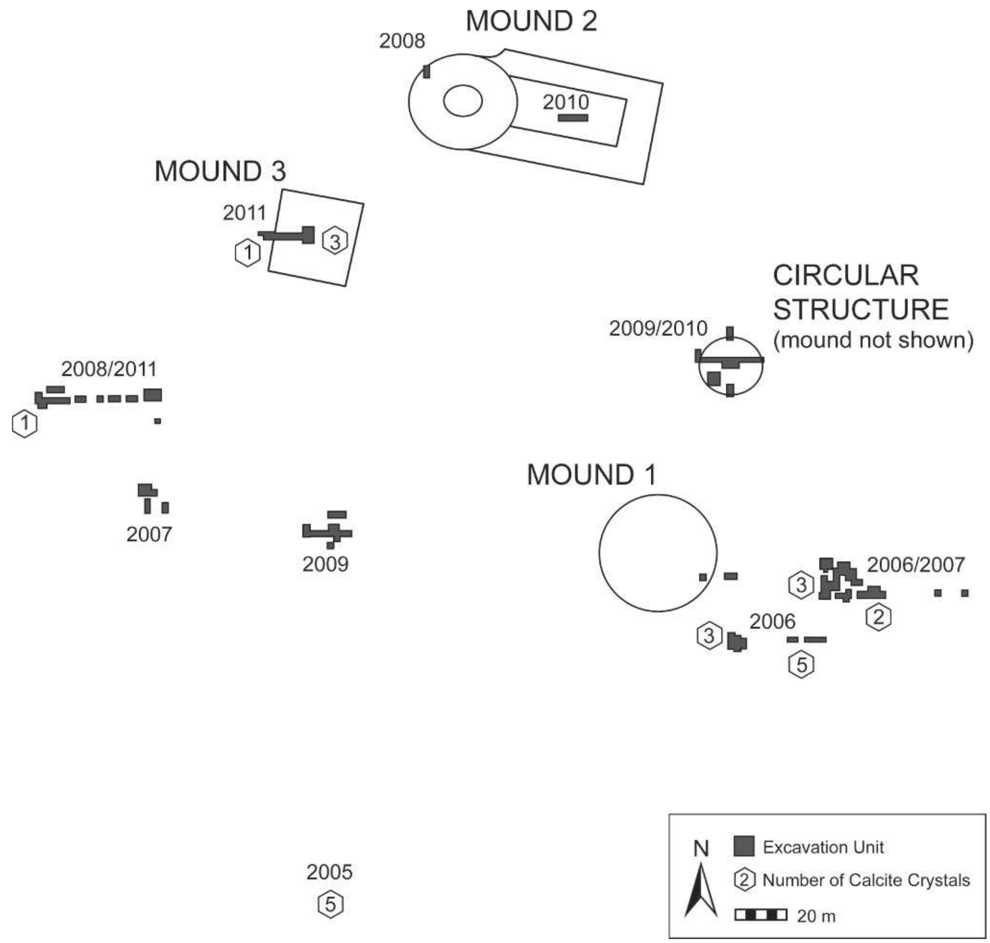

Figure 8. Castalian Springs site map with preliminary number of raw and partially worked calcite crystals recovered from the 2005–11 MTSU excavations.

appears excessive for household consumption and little to no household or domestic debris is evident.'' A crafting locale ''is just the opposite where household debris is quite evident and the level of production is consistent with household consumption'' (Boles 2012:72). A fluorite workshop at Kincaid Mounds was delineated inside the palisade northeast of Mound 10 based on the recovery of substantial amounts of fluorite artifacts with production tools (including blades, drills, and abraders) over a burned structure (Boles 2012:72–73). Fluorite production at Angel Mounds is suggested for the East Village area, where 80 percent (51 of 63) of the recorded fluorite specimens in that area were found in nonmortuary contexts such as palisade trenches, structure postholes, and a pit feature (Schilling and Baumann 2012). Schilling and Baumann (2012:7) suggest fluorite production/use was available to most site residents, and fluorite items ''were not necessarily 'prestige goods' based on composition alone.''

The authors are confident that some type of crystal (calcite) production was underway at the Castalian Springs mound center. Resources were available as the site was established within an area rich in mineral vein deposits (see Figure 2). Also, three of the four earplugs known for the study area have been recovered from this site, along with a substantial number of unworked (and one partially worked) crystals previously unknown from other mound centers in the Middle Cumberland region. Spatial distribution of the crystals recovered to date illustrates the heaviest concentration to be east-southeast of Mound 1, with secondary concentrations on Mound 3 and in the southern site area (see Figure 8). Is the concentration east-southeast of Mound 1 associated with a wall-trench structure exposed in the vicinity during the 2006–7 seasons?[5] Also, the crude and variable forms of the Mound 3 earplugs are intriguing. Does this represent evidence of site residents making their own crystal earplugs, thereby suggesting household crystal production? Or are these specialized forms for some as yet unknown purpose? There are numerous possibilities and scenarios to consider, but at this time it is premature to characterize the nature of the crystal production (i.e., workshop vs. crafting locale) until all soil samples have been processed and all artifacts have been tabulated.

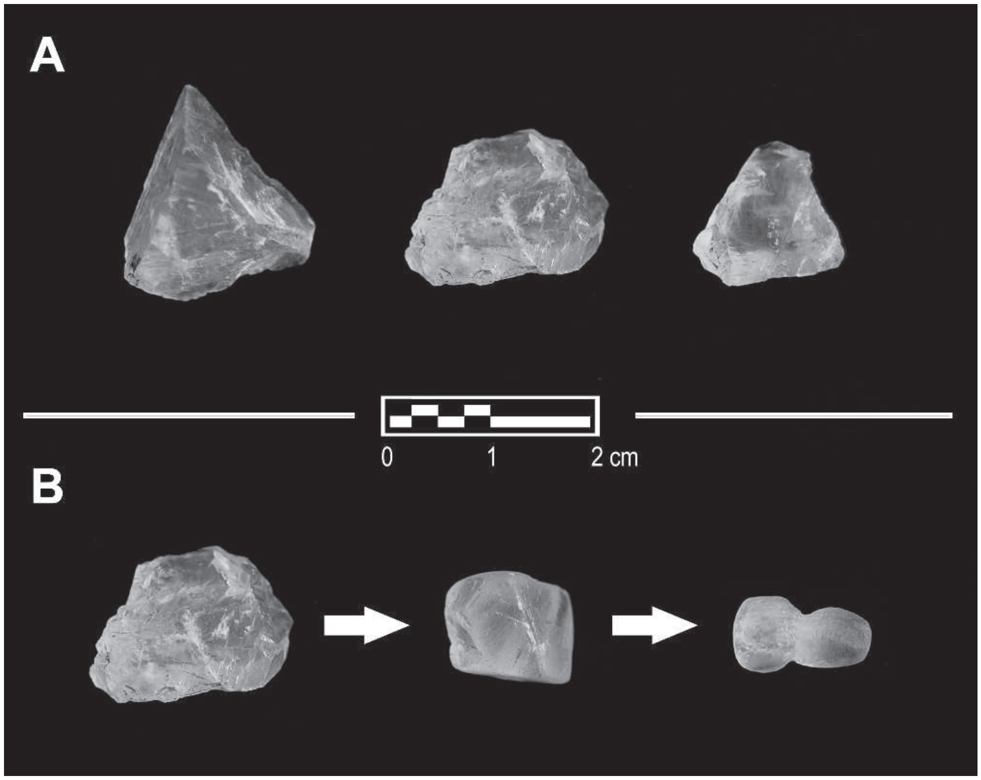

Figure 9. (A) representative sample of raw calcite crystals recovered from the 2005–11 MTSU excavations at Castalian Springs; (B) speculative production progression from raw calcite crystal to partially worked crystal to finished product.

Notes

Acknowledgments. The authors would like to thank John Dowd for sharing his recollection of events surrounding the recovery of the Brentwood locality bird pendant and Mark Clark for allowing the authors to photograph the pendant. Rick Taylor shared important details about the Cheyenne Hills earplug with the senior author at the time of discovery. Jeff Chapman and Bobby Braly (Frank H. McClung Museum, University of Tennessee) alerted the authors to the Hogan site specimen. We extend our appreciation to Steve Boles for kindly sharing his thesis research results regarding lower Ohio River region fluorite sources and artifacts. Mike Hoyal, Assistant State Geologist with the Tennessee Geological Survey, provided the mineral identifications. Julie Moore sketched the earplug images in Figure 7.

[1] Analysis of the Mound 3 excavation results are ongoing (Smith et al. 2012).
[2] The specific hilltop remains unknown. Mr. Dowd (personal communication, 2010) recalls the locale was near a substantial Mississippian occupation in Brentwood, most likely the Arnold (40WM5) site.
[3] The material type will remain a mystery as Clark (1878:275) noted these items were stolen.
[4] Astate number has not been assigned as the site's exact location has yet to be defined.
[5] The 2006 and 2007 field seasons exposed a wall trench structure (designated Structure 1) and a series of reconstruction efforts just east of Mound 1. Analyses of the structure and associated artifacts are ongoing.

References Cited

Ball, Donald B.
2011 Materials from Castalian Springs, Sumner County, Tennessee, Inventoried in Record of Relics No. 2 by William Edward Myer. Copy on file, Middle Cumberland Mississippian Survey Project, Department of Sociology and Anthropology, Middle Tennessee State University, Murfreesboro.

Baltus, Melissa R., and Sarah E. Baires
2012 Elements of Ancient Power in the Cahokian World. *Journal of Social Archaeology* 12(2):167–192.

Barrier, Casey R., and Myrisa K. Byrd
2008 Gypsum Mining at Indian Salts Cave: An Examination of Early Woodland Subterranean Mineral Extraction. In *Cave Archaeology of the Eastern Woodlands: Essays in Honor of Patty Jo Watson*, edited by David H. Dye, pp. 79–96. University of Tennessee Press, Knoxville.

Batty, J. V., H. D. Snedden, G. M. Potter, and B. K. Shibler
1947 *Concentration of Fluorite Ores from Arizona, California, Idaho, Montana, Nevada, and Wyoming.* Report of Investigations, November. United States Department of the Interior, Bureau of Mines.

Beahm, Emily L.
2012 Exploring the Eastern Limits of the Middle Cumberland Region: Recent Testing at Two Mississippian Mound Sites in Smith County, Tennessee. Paper presented at the 24th annual meeting of Current Research in Tennessee Archaeology, Nashville.

Beahm, Emily L., and Kevin E. Smith
2012 Mississippian Ceramics and Settlement Complexity: Insights from the Beasley Mounds (40SM43), Smith County, Tennessee. *Tennessee Archaeology* 6(1 and 2): 148–162.

Black, Glenn A.
1967 *Angel Site: An Archaeological, Historical, and Ethnological Study*. Indiana Historical Society, Indianapolis. Lakeside Press, R. R. Donnelly and Sons, Chicago, and Crawfordsville, IN.

Boles, Steve
2011 Thunder on the Ohio: Introducing Storms-as-he-Walks, Red Horn's Companion. *Central State Archaeological Journal* 58(4):237–249.
2012 Fluorite: A Mineral of Importance in Midcontinental Prehistory. Unpublished master's thesis, Department of Anthropology, Southern Illinois University, Carbondale.

Bostrom, Peter A.
2007 Lithic Casting Lab, Fluorite Figures. Electronic document, http://www.lithiccastinglab.com/gallery-pages/2007octoberfluoritefigurinespage3.htm/. Accessed 6 October 2010.

Boyer, Jeffrey L., John T. Zachman, and Guadalupe Martinez
1997 *The Fluorite Ridge Fluorspar Mines, Luna County, New Mexico.* Archaeology Notes 215. Museum of New Mexico, Office of Archaeological Studies, Santa Fe.

Brain, Jeffrey P., and Philip Phillips
1996 *Shell Gorgets, Styles of the Late Prehistoric and Protohistoric Southeast*. Harvard University. Peabody Museum Press, Cambridge, MA.

Butler, Brian
1981 Sellars: A Small Mound Center in the Hinterlands. *Tennessee Anthropologist* 6(1):37–60.

Clark, W. M.
1878 Antiquities of Tennessee. *Smithsonian Institution Annual Report for 1877,* 269–276. Washington, DC.

Clinton, Jennifer M., and Tanya M. Peres
2011 Pests in the Garden: Testing the Garden-Hunting Model at the Rutherford-Kizer Site, Sumner County, Tennessee. *Tennessee Archaeology* 5(2):131–141.

Cole, Fay-Cooper, Robert Bell, John Bennett, Joseph Caldwell, Norman Emerson, Richard MacNeish, Kenneth Orr, and Roger Willis
1951 *Kincaid: A Prehistoric Illinois Metropolis*. University of Chicago Press, Chicago.

Cowan, Frank L., and N'omi B. Grebe
2002 Hopewell Mound 11: Yet Another Look at an Old Collection. *Hopewell Archeology: The Newsletter of Hopewell Archeology in the Ohio River Valley* 5(2):7–11.

Cox, Stephen D. (editor)
1985 *Art and Artisans of Prehistoric Middle Tennessee*. Tennessee State Museum, Nashville.

Cressler, Alan, Jan F. Simek, Todd M. Ahlman, J. L. Bennett, and Jay D. Franklin
1999 Prehistoric Mud Glyph Cave Art from Alabama. *Southeastern Archaeology* 18(l):35–44.

Crothers, George
2001 Mineral Mining and Perishable Remains in Mammoth Cave, Kentucky: Examining Social Process During the Early Woodland Period. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope B. Drooker, pp. 314–334. Occasional Paper No. 28. Center for Archaeological Investigations, Southern Illinois University, Carbondale.

Crothers, George, Charles H. Faulkner, Jan F. Simek, Patty Jo Watson, and P. Willey
2002 Woodland Cave Archaeology in Eastern North America. In *The Woodland Southeast*, edited by David G. Anderson and Robert C. Mainfort, Jr., pp. 502–524. University of Alabama Press, Tuscaloosa.

Deter-Wolf, Aaron, and Tanya M. Peres
2014 Embedded: 5,000 Years of Shell Symbolism in the Southeast. In *Trends and Traditions in Southeastern Zooarchaeology*, edited by Tanya M. Peres, pp. 161–185. University Press of Florida, Gainesville.

Douglas, Joe, Brian Roebuck, and Lynn Roebuck
2008 Torches in the Dark: Late Mississippian Exploration of Hubble Post Office Cave. In *Cave Archaeology of the Eastern Woodlands: Essays in Honor of Patty Jo Watson*, edited by David H. Dye, pp. 157–168. University of Tennessee Press, Knoxville.

DuVall & Associates, Inc
1993 *Burial Removal and Archaeological Salvage at Site 40DV195, the Cheyenne Hills Site, in Davidson County, Tennessee*. DuVall & Associates, Inc., Franklin, TN, Submitted to KK&H, a Tennessee Partnership, and Perryman Construction Company, Inc., Brentwood, TN. Copy on file, Tennessee Division of Archaeology, Nashville.

Dye, David H.
2009 War Honors and Tattoos: Mississippian Soul Capture, Dedication, and Recycling. Paper presented at the 66th annual meeting of the Southeastern Archaeological Conference, Mobile, AL.

Emerson, Thomas E.
1982 *Mississippian Stone Images in Illinois.* Bulletin No. 6. Illinois Archaeological Survey, Urbana.
1989 Water, Serpents, and the Underworld: An Exploration into Cahokian Symbolism. In *The Southern Ceremonial Complex: Artifacts and Analysis: The Cottonlandia Conference*, edited by Patricia Galloway, pp. 45–92. University of Nebraska Press, Lincoln.
1995 *Settlement, Symbolism, and Hegemony in the Cahokian Countryside*. Ph.D. dissertation, University of Wisconsin, Madison, ProQuest/UMI No. 9510048.
1997 *Cahokia and the Archaeology of Power*. University of Alabama Press, Tuscaloosa.

Faulkner, Charles H.
1998 Cavers and Archaeologists: The Study of Mud Glyph Cave. In *Cave Archaeology of the Eastern Woodlands: Essays in Honor of Patty Jo Watson*, edited by David H. Dye, pp. 193–202. University of Tennessee Press, Knoxville.

Faulkner, Charles H., Bill Deane, and Howard H. Earnest, Jr.
1984 A Mississippian Period Ritual Cave in Tennessee. *American Antiquity* 49:350–361.

Faulkner, Charles H., and Jan F. Simek
2001 Variability in the Production and Preservation of Prehistoric Mud Glyphs in Southeastern Caves. In *Fleeting Identities: Perishable Material Culture in Archaeological Research*, edited by Penelope B. Drooker, pp. 335–356. Southern Illinois University Press, Carbondale.

Ferguson, Robert B. (editor)
1972 *The Middle Cumberland Culture.* Publications in Anthropology No. 3. Vanderbilt University, Nashville.

Floyd, Robert J.
1965 *Tennessee Rock and Mineral Resources.* Bulletin 66. Tennessee Department of Conservation, Division of Geology, Nashville.

Fortier, Andrew
2001 *The Dash Reeves Site: A Middle Woodland Village and Lithic Production Center in the American Bottom.* American Bottom Archaeology FAI-270 Site Reports Vol. 28. University of Illinois Press, Urbana.
2008 The Archaeological Contexts and Themes of Middle Woodland Symbolic Representation in the American Bottom. *Illinois Archaeology* 20:1–47.

Fortier, Andrew, Thomas O. Maher, Joyce A. Williams, Michael C. Meinkoth, Kathryn E. Parker, and Lucretia S. Kelley
1989 *The Holding Site: A Hopewell Community in the American Bottom (11-Ms-118).* American Bottom Archaeology FAI-270 Site Reports Vol. 19. University of Illinois Press, Urbana.

Franklin, Jay D.
2001 Excavating and Analyzing Prehistoric Lithic Quarries: An Example from 3rd Unnamed Cave, Tennessee. *Midcontinental Journal of Archaeology* 26:199–217.
2008 Big Cave Archaeology in the East Fork Obey River George. In *Cave Archaeology of the Eastern Woodlands: Essays in Honor of Patty Jo Watson*, edited by David H. Dye, pp. 141–156. University of Tennessee Press, Knoxville.

Galloway, Patricia (editor)
1989 *The Southeastern Ceremonial Complex: Artifacts and Analysis*. University of Nebraska Press, Lincoln.

Garland, Elizabeth Baldwin
1992 *The Obion Site: An Early Mississippian Center in Western Tennessee.* Report of Investigations 7. Cobb Institute of Archaeology, Mississippi State University, Starkville.

Gilbert, William Harlan
1943 *The Eastern Cherokees.* Anthropological Papers 23. Bulletin 133, pp. 169–413. Bureau of American Ethnology Smithsonian Institution, Washington, DC.

Hardeman, William D., and Robert A. Miller
1959 *Map of Mineral Resources and Mineral Industries in Tennessee*. Tennessee Department of Conservation and Commerce, Division of Geology, Nashville.

Hodge, Shannon C., Michael K. Hampton, and Kevin E. Smith
2010 Ritual Use of Human Skulls at Castalian Springs, Tennessee. Paper presented at the 67th annual meeting of the Southeastern Archaeological Conference, Lexington, KY.

Hudson, Charles
1976 *The Southeastern Indians*. University of Tennessee Press, Knoxville.

Jewell, W. B.
1947 *Barite, Fluorite, Galena, Sphalerite Veins of Middle Tennessee.* Bulletin 51. Tennessee Department of Conservation, Division of Geology, Nashville.

Jones, Joseph
1876 Explorations of the Aboriginal Remains of Tennessee. *Smithsonian Contributions to Knowledge* 22(259):1–171.

Kentucky Geological Survey
2008 Western Kentucky Fluorspar District. Electronic document, http://www.uky.edu/KGS/im/wkfd.htm/. Accessed 30 November 2011.

Kincaid Mounds Support Organization
2012 The Kincaid Mounds, Photo Slideshow. Electronic document, http://www.kincaidmounds.com/slideshow.html/. Accessed 9 July 2012.

Klippel, Walter E., and William M. Bass (editors)
1984 *Averbuch: A Mississippian Manifestation in the Nashville Basin*, vol. 1, *Observations*. Department of Anthropology, University of Tennessee, Knoxville, Submitted to U.S. Department of Interior, National Park Service, Contract CX 5000-9-5943.

Knight, Vernon James, Jr., James A. Brown, and George E. Lankford
2001 On the Subject Matter of Southeastern Ceremonial Complex Art. *Southeastern Archaeology* 20:129–141.

Koldehoff, Brad
1995 The Bunkum Road Site: A Stirling Phase Midden in the American Bottom. *Illinois Antiquity* 30(3):4–5.

Lankford, George E.
2007a The Great Serpent in Eastern North America. In *Ancient Objects and Sacred Realms: Interpretations of Mississippian Iconography*, edited by F. Kent Reilly, III. and James F. Garber, pp. 107–135. University of Texas Press, Austin.
2007b Some Cosmological Motifs. In *Ancient Objects and Sacred Realms: Interpretations of Mississippian Iconography*, edited by F. Kent Reilly, III. and James F. Garber, pp. 8–38. University of Texas Press, Austin.

Lien, Paul M., Ripley P. Bullen, and Clarence H. Webb
1974 A Poverty Point Owl Amulet Found in Florida. *The Florida Anthropologist* 27(4):165–168.

Miller, Robert A.
1974 *The Geologic History of Tennessee.* Bulletin 74. Tennessee Department of Conservation, Division of Geology, Nashville.

Mindat.org
2013 Central Tennessee Ba-F-Pb-Zn District, Smith Co. Tennessee, USA. Electronic document, http://www.mindat.org/loc-129869.html/. Accessed 1 June 2013.

Minerals Zone
2005 Fluorite. Electronic document, http://www.mineralszone.com/minerals/fluorite.html/. Accessed 2 December 2011.

Mooney, James
1900 Myths of the Cherokees. In *Ninetieth Annual Report, Bureau of American Ethnology, 1897–98*, pp. 3–548. Smithsonian Institution, Washington, DC.

Moore, Michael C.
2005 *The Brentwood Library Site: A Mississippian Town on the Little Harpeth River, Williamson County, Tennessee.* Research Series 15. Tennessee Department of Environment and Conservation, Division of Archaeology, Nashville.

Moore, Michael C., Emanuel Breitburg, Kevin E. Smith, and Mary Beth Trubitt
2006 One Hundred Years of Archaeology at Gordontown: A Fortified Mississippian Town in Middle Tennessee. *Southeastern Archaeology* 25:89–109.

Moore, Michael C., and Kevin E. Smith
2001 *Archaeological Excavations at the Rutherford-Kizer Site: A Mississippian Mound Center in Sumner County,*

Tennessee. Research Series No. 13. Tennessee Department of Environment and Conservation, Division of Archaeology, Nashville.

2009 *Archaeological Expeditions of the Peabody Museum in Middle Tennessee, 1877–1884.* Research Series No. 16. Tennessee Department of Environment and Conservation, Division of Archaeology, Nashville.

Morse, Dan F.

1963 *Report of 1962 Excavations in the Stewart County, Tennessee, Portion of Lake Barkley Reservoir*. Department of Anthropology, University of Tennessee, Knoxville, Submitted to U.S. Department of Interior, National Park Service, Contract No. 14-10-0131-917.

Morse, Dan F., Phyllis Morse, and Merrill Emmons

1961 The Southern Cult: The Emmons Site, Fulton County, Illinois. *Central States Archaeological Journal* 8(4):124–140.

Muller, Jon

1986a *Archaeology of the Lower Ohio River Valley*. Academic Press, New York.

1986b Pans and a Grain of Salt: Mississippian Specialization Revisited. *American Antiquity* 51:405–409.

1987 Salt, Chert, and Shell: Mississippian Exchange and Economy. In *Specialization, Exchange, and Social Complexity*, edited by Elizabeth M. Brumfiel and Timothy K. Earle, pp. 10–21. Cambridge University Press, Cambridge.

Munson, P. J., and C. A. Munson

1990 *The Prehistoric and Early Historic Archaeology of Wyandotte and Other Caves in Southern Indiana.* Prehistoric Research Series 7(1). Indiana Historical Society, Indianapolis.

Munson, Patrick J., Kenneth B. Tankersley, Cheryl Ann Munson, and Patty Jo Watson

1989 Prehistoric Selenite and Satinspar Mining in the Mammoth Cave System, Kentucky. *Midcontinental Journal of Archaeology* 14:119–145.

Myer, William Edward

1894 An Old Shawnee Town in Tennessee. *The Archaeologist* 2(1):6–13.

1917 The Remains of Primitive Man in Cumberland Valley, Tennessee. *Proceedings of the Nineteenth International Congress of Americanists,* 96–102. Washington, DC.

1923 Stone Age Man in the Middle South. Unpublished manuscript, National Anthropological Archives, NAA MS 2566-A, Smithsonian Institution, Washington, DC, Transcription compiled and edited by Kevin E. Smith, 2007.

1972 Two Prehistoric Villages in Middle Tennessee. Reprinted by Southeastern Indian Antiquities Survey, Nashville. Originally published 1928, *Forty-first Annual Report of the Bureau of American Ethnology* 1919–24: 485–614.

Nolan, David J., and Richard L. Fishel

2009 Archaic Cultural Variation and Lifeways in West-Central Illinois. In *Archaic Societies: Diversity and Complexity across the Mid-Continent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 401–490. State University of New York Press, Albany.

Pauketat, Timothy R.

1998a Refiguring the Archaeology of Greater Cahokia. *Journal of Archaeological Research* 6:45–89.

1998b *The Archaeology of Downtown Cahokia: The Tract I5A and Dunham Tract Excavations* Studies in Archaeology No. 1. Illinois Transportation Archaeological Research Program, University of Illinois, Urbana.

Pauketat, Timothy R., Lucretia S. Kelly, Gayle J. Fritz, Neal H. Lopinot, Scott Elias, and Eve Hargrave

2002 The Residues of Feasting and Public Ritual at Early Cahokia. *American Antiquity* 67:257–279.

Pauketat, Timothy R., and Brad Koldehoff

2002 Cahokian Ritual and the Ramey Field: New Insights from Old Collections. *Southeastern Archaeology* 21:79–91.

Perino, Gregory

1968 The Pete Klunk Mound Group, Calhoun County, Illinois: The Archaic and Hopewell Occupations. In *Hopewell and Woodland Site Archaeology in Illinois*, edited by James A. Brown, pp. 9–124. Bulletin No. 6. Illinois Archaeological Survey, Urbana.

Pickering, Robert B., and Frank E. Rackerby

2004 Some Owl Effigies from the Kincaid Mounds Region: Or Why the Professional Should Give a Hoot about the Amateur Archaeologist. In *Aboriginal Ritual and Economy in the Eastern Woodlands: Essays in Memory of Howard Dalton Winters*, edited by Anne-Marie Cantwell, Lawrence A. Conrad, and Jonathan E. Reyman, pp. 261–267. Scientific Papers Vol. 30. Illinois State Museum, Springfield.

Pritchard, Erin

2008 Deep Cave Mining: Archaeological and GIS Investigations of a Prehistoric Gypsum Mine at Hubbards Cave. In *Cave Archaeology of the Eastern Woodlands: Essays in Honor of Patty Jo Watson*, edited by David H. Dye, pp. 97–116. University of Tennessee Press, Knoxville.

Putnam, Frederic Ward

1878 Archaeological Explorations in Tennessee. *Eleventh Annual Report of the Trustees of the Peabody Museum of Archaeology and Ethnology* 2(2):305–360.

1882 Notes on the Copper Objects from North and South America, Contained in the Collections of the Peabody Museum. *Fifteenth Annual Report of the Trustees of the Peabody Museum of Archaeology and Ethnology* 3(2):83–148.

Reinertsen, D. L., and J. M. Masters

2010 Fluorite-Illinois' State Mineral. Geobit 4, Illinois State Geological Survey. Electronic document, http://www.isgs.illinois.edu/maps-data-pub/publications/geobits/geobit4.shtml/. Accessed 30 November 2011.

Schilling, Timothy, and Timothy Baumann

2012 Interrogating the Adonis of Newburgh: Fluorite Crafting and Use at Angel. Paper presented at the 77th annual meeting of the Society for American Archaeology, Memphis, TN.

Schwegman, John E.

2011 Kincaid Mounds: A Prehistoric Cultural and Religious Center in Southern Illinois. Kincaid Mounds Support Organization. Electronic document, http://www.kincaidmounds.com/history.htm/. Accessed 9 July 2012.

Seal, Robert R., II, Brian J. Cooper, and James R. Craig

1985 Anisotropic Sphalerite of the Elmwood-Gordonsville Deposits, Tennessee. *Canadian Mineralogist* 23:83–88.

Sharp, Robert V., Vernon James Knight, Jr., and George E. Lankford

2011 Woman in the Patterned Shawl: Female Effigy Vessels and Figurines from the Middle Cumberland River Basin. In *Visualizing the Sacred: Cosmic Visions, Regionalism, and the Art of the Mississippian World*, edited by George E. Lankford, F. Kent Reilly, III, and James F. Garber, pp. 177–198. University of Texas Press, Austin.

Sharp, Robert V., Kevin E. Smith, and David H. Dye

2010 The Classic Braden Style and Its Legacy in the Nashville Basin. Paper presented at the 75th annual meeting of the Society for American Archaeology, St. Louis, MO.

Shofner, Gregory A., Hugh H. Mills, and Jason E. Duke

2001 A Simple Map Index of Karstification and Its Relationship to Sinkhole and Cave Distribution in Tennessee. *Journal of Cave and Karst Studies* 63(2):67–75.

Simek, Jan F., and Alan Cressler

2008 On the Backs of Serpents: Prehistoric Cave Art in the Southeastern Woodlands. In *Cave Archaeology of the Eastern Woodlands: Essays in Honor of Patty Jo Watson*, edited by David H. Dye, pp. 169–192. University of Tennessee Press, Knoxville.

Simek, Jan F., Alan Cressler, Charles H. Faulkner, Todd M. Ahlman, Brad Creswell, and Jay D. Franklin

2001 The Context of Late Prehistoric Cave Art: The Art and Archaeology of 11th Unnamed Cave, Tennessee. *Southeastern Archaeology* 20:142–153.

Smith, Kevin E.

1992 The Middle Cumberland Region: Mississippian Archaeology in North Central Tennessee. Unpublished Ph.D. dissertation, Department of Anthropology, Vanderbilt University, Nashville.

Smith, Kevin E., and Emily L. Beahm

2011 Through the Looking Glass: Mississippian Iconography through the Lens of the Castalian Springs Mounds, Sumner County, Tennessee. Paper presented at the 68th annual meeting of the Southeastern Archaeological Conference, Jacksonville, FL.

Smith, Kevin E., Emily L. Beahm, and Michael K. Hampton

2012 The Castalian Springs Mounds (40SU14) 2011: Investigations of Mound 3, Sumner County, Tennessee. Paper presented at the 24th annual meeting of Current Research in Tennessee Archaeology, Nashville.

Smith, Kevin E., and James V. Miller

2009 *Speaking with the Ancestors: Mississippian Stone Statuary of the Tennessee-Cumberland Region*. University of Alabama Press, Tuscaloosa.

Smith, Kevin E., and Michael C. Moore

1994 Excavation of a Mississippian Farmstead at the Brandywine Pointe Site (40DV247), Cumberland River Valley, Tennessee. *Midcontinental Journal of Archaeology* 19:198–222.

1999 ''Through Many Mississippian Hands'': Late Prehistoric Exchange in the Middle Cumberland Valley. In *Raw Materials and Exchange in the Mid-South*, edited by Evan Peacock and Samuel O. Brookes, pp. 95–115. Archaeological Report No. 29. Mississippi Department of Archives and History, Jackson.

Smith, Kevin E., Michael C. Moore, and Stephen T. Rogers

2009 The Enigma of the Noel Cemetery: Thruston's ''Ancient Metropolis of the Stone Grave Culture.'' Paper presented at the 66th annual meeting of the Southeastern Archaeological Conference, Mobile, AL.

Steponaitis, Vincas P., Vernon James Knight, Jr., George E. Lankford, Robert V. Sharp, and David H. Dye

2011 Iconography of the Thruston Tablet. In *Visualizing the Sacred: Cosmic Visions, Regionalism, and the Art of the Mississippian World*, edited by George E. Lankford, F. Kent Reilly, III, and James F. Garber, pp. 137–176. University of Texas Press, Austin.

Strezewski, Michael

2003 *Mississippian Period Mortuary Practices in the Central Illinois River Valley: A Region-Wide Survey and Analysis*. Ph.D. dissertation, Department of Anthropology, Indiana University, Bloomington, Proquest/UMI No. 3122741.

Tankersly, Kenneth B.

1996 Prehistoric Mining in the Mammoth Cave System. In *Of Caves and Shell Mounds*, edited by Kenneth C. Carstens and Patty Jo Watson, pp. 33–39. University of Alabama Press, Tuscaloosa.

Tennessee Division of Natural Areas

2013 Caves of the Central Basin. Tennessee Department of Environment and Conservation, Division of Natural Areas. Copy on file, Tennessee Division of Archaeology, Nashville.

Thruston, Gates P.

1972 *The Antiquities of Tennessee and the Adjacent States.* Reprinted. Tenase Company, Knoxville. Originally published 1897. 2nd ed., Robert Clarke, Cincinnati.

Trubitt, Mary Beth D.

1996 *Household Status, Marine Shell Bead Production, and the Development of Cahokia in the Mississippian Period*. Ph.D. dissertation, Department of Anthropology, Northwestern University, Chicago, Proquest/UMI No. 9632796.

Walling, Richard, Lawrence Alexander, and Evan Peacock

2000 *The Jefferson Street Bridge Project: Archaeological Investigations at the East Nashville Mounds Site (40Dv4) and the French Lick/Sulphur Dell (40Dv5) Site, in Nashville, Davidson County, Tennessee.* Publications in Archaeology No. 7. Tennessee Department of Transportation, Office of Environmental Planning and Permits, Nashville.

Watson, Patty Jo (editor)

1974 *The Archeology of the Mammoth Cave Area*. Academic Press, New York.

Webb, Clarence H.

1968 The Extent and Content of Poverty Point Culture. *American Antiquity* 33:297–321.

Wiant, Michael D., Kenneth B. Farnsworth, and Edwin R. Hajic

2009 The Archaic Period in the Lower Illinois River Basin. In *Archaic Societies: Diversity and Complexity Across the Midcontinent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 229–286. State University of New York Press, Albany.

Wolforth, Thomas R., and Lynne Mackin Wolforth

2000 Fluorite Figurines from the Midcontinent. In *Mounds, Modoc, and Mesoamerica: Papers in Honor of Melvin L. Fowler*, edited by Steven R. Ahler, pp. 455–467. Scientific Papers Vol. 28. Illinois State Museum, Springfield.

Worne, Heather A.

2011 Conflicting Spaces: Bioarchaeological and Geophysical Perspectives on Warfare in the Middle Cumberland Region of Tennessee. Unpublished Ph.D. dissertation, Department of Anthropology, State University of New York, Binghamton.