It is well known that the Mississippi period in the American South (A.D. 1000–1700) was a time of artistic florescence, during which figural art—images of supernatural animals and humans—were crafted in a variety of media, including stone, pottery, shell, and copper (Knight et al. 2001). Contrary to earlier views that all of this art belonged to a single “Southeastern Ceremonial Complex,” we now know that it was produced in a number of distinctive regional styles and was used and understood in regionally distinctive ways (Brain and Phillips 1996:398; Brown 1989, 2004; Knight 2006). Yet recognizing these regional styles is sometimes made difficult by the fact that objects were often moved to places far from where they were made. Thus, the assemblage of imagery found at any given Mississippian center is likely to include a mixture of local products and imports, thereby blurring our perception of what constitutes the local style, as well as the nature of long-distance social interactions (Knight and Steponaitis 2011; Steponaitis and Knight 2004).

Sorting out such mixtures often requires provenance studies, which link the raw materials in these objects to particular geological sources. Geological provenance, especially when combined with geographical data and stylistic comparisons, can provide powerful evidence for where Mississippian objects were actually made and thereby can give us a clearer view of the patterns of craft production and distribution in ancient times.

Our goal in this essay is to determine the provenance of one distinctive category of Mississippian figural art: large limestone effigy pipes that are found over a wide area including Arkansas, Louisiana, Mississippi, and Alabama. We do so using a novel but rather simple technique: the geological source of the stone is inferred from the fossils visible in its surface. In contrast to the techniques that have been usefully employed in provenance studies of other materials, our method...
is completely nondestructive and requires no instruments other than a hand lens. It works because the stone used in making the pipes is highly fossiliferous and the limestone deposits available in the South vary greatly in geological age, thereby yielding different and distinctive fossil assemblages.

We begin by describing the sample of effigy pipes that were examined, focusing on their general characteristics and geographical distribution. Next we present the evidence that links these pipes to the Glendon limestone, which outcrops most prominently near Vicksburg, Mississippi. And finally we discuss the implications of this result for understanding regional art styles and the movement of elaborately crafted objects across the Mississippian world.

**The Sample**

Our sample consists of 18 limestone effigy pipes that were found at seven different Mississippian sites (Table 1, Figure 1). These generally fall into two groups. The first comprises a dozen pipes that Brain and Phillips assigned to their “Bellaire style.” These pipes all depict supernatural beings in the round that show, in varying combinations, the characteristics of panthers, snakes, and raptors. These creatures, when depicted in their entirety, are typically placed in a crouching position with the pipe’s bowl on the top and the stem hole in the rear, so that the being faces away from the smoker.

Iconographically, the versions that mainly show panther or snake characteristics are surely depictions of the Underwater Panther or Great Serpent, two aspects of the same supernatural being who was well known to native peoples across the Great Plains and Eastern Woodlands (Lankford 2007a). The raptors may well be creatures associated with equally widespread stories about the path that souls take after death (Aftandilian 2007:438–449; Lankford 2007b). Although a full analysis of style is far beyond the scope of this essay, we agree with Brain and Phillips that these pipes show some stylistic coherence, even if not perfectly so. Yet the common denominator of these pipes lies not only in style (execution) but also in theme (subject matter) and medium (stone). If and when a true Bellaire style is defined, it will probably contain a broader range of themes and media, perhaps analogous to what Brain and Phillips have called the “Bellaire style system” (1996:390–396; cf. Knight and Steponaitis 2011). Thus, for present purposes, we use a more neutral term and simply call them the Bellaire group.

The Bellaire pipes were initially the main focus of our study. But in the process of examining these objects at various museums, we also had the opportunity to look at a number of other limestone pipes from the same or closely related sites. These six effigies constitute our “other pipes,” essentially a catchall category for pipes that differ thematically from the Bellaire group. Two depict crouching humans and come from sites in the Lower Mississippi Valley; Brain and Phillips note that one of these “is related to the Bellaire style of animal effigy pipes” (1996:384). Suffice it to say for now that we agree that this relationship exists and may well be the basis for ultimately placing these pipes in the same, overarching style. The four remaining pipes were all found at the Moundville site in Alabama and represent four different themes: a man holding a pipe (whose bowl is shaped like a pot), a pot by itself, a raptor, and a likely frog (but too eroded for us to be certain).

Our sample includes most, but not all, of the limestone pipes that Brain and Phillips assigned to their “Bellaire style.” Of the 19 pipes they compiled, 12 are in our sample. Most of the missing pipes are viewed by Brain and Phillips as unusual or “degenerate” examples of the style, although one (Ark-Ch-AP1) is the classic example from the Bellaire site in Arkansas believed to have been made by the same hand as one of the pipes (Ala-Tu-M1) we examined from Moundville in Alabama (for illustrations, see Jeter 2007:Figure 9.2; Lemley and Dickinson 1937:Plates 5–6, 1964:Figure 2; Penney 1985:Plate 130). Regrettably, we did not have the opportunity to look at any of the pipes from Spiro in Oklahoma.

All but one of the pipes in Table 1 were examined by both of us in person, macroscopically and with a hand lens. One of us (Steponaitis) had the archaeological expertise to select the appropriate pipes, and the other (Dockery) provided the paleontological expertise to identify the visible fossils. One pipe (Ala-Tu-M161) was examined in person only by the former, but his identification of the key fossils was confirmed by the latter from photographs.
Table 1. Limestone Effigy Pipes Examined in This Study.

<table>
<thead>
<tr>
<th>Group</th>
<th>Designation</th>
<th>County/ Parish</th>
<th>Effigy Type</th>
<th>Museum Number</th>
<th>Material</th>
<th>Figure Number</th>
<th>Published Illustrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bellaire Group</td>
<td>Ala-Tu-M1</td>
<td>Tuscaloosa Co., AL</td>
<td>panther</td>
<td>PMAE 48121</td>
<td>Glendon limestone</td>
<td>1e</td>
<td>Brain and Phillips 1996:385; Moore 1905:Figures 1–3; Williams and Brain 1983:Figure 7.32a-c</td>
</tr>
<tr>
<td></td>
<td>Ala-Tu-M91</td>
<td>Tuscaloosa Co., AL</td>
<td>panther</td>
<td>NMAI 17.893</td>
<td>Glendon limestone</td>
<td></td>
<td>Brain and Phillips 1996:385; Moore 1905:Figures 165–166; Moorehead 1910:II:Figure 488; West 1934:Plate 90.1</td>
</tr>
<tr>
<td></td>
<td>Ala-Tu-M161</td>
<td>Tuscaloosa Co., AL</td>
<td>panther</td>
<td>TSM 82.100.820</td>
<td>Glendon limestone</td>
<td>1f</td>
<td>Brain and Phillips 1996:385; Cox 1985:Plate 6; Moore 1905:Figure 1; Thruston 1890:Figure 84</td>
</tr>
<tr>
<td>Miss-Ad-E1</td>
<td>Emerald</td>
<td>Adams Co., MS</td>
<td>panther-raptor-snake</td>
<td>MPM 16205</td>
<td>Glendon limestone</td>
<td>1b</td>
<td>Brain and Phillips 1996:387; Brown 1926:Figures 218, 223–224; Phillips and Brown 1978:Figure 267; West 1934:Plate 91.2</td>
</tr>
<tr>
<td>Miss-Ad-E2</td>
<td>Emerald</td>
<td>Adams Co., MS</td>
<td>panther-raptor-snake</td>
<td>MPM 16206</td>
<td>Glendon limestone</td>
<td></td>
<td>Brain and Phillips 1996:387; Brown 1926:Figure 222; West 1934:Plate 89.3</td>
</tr>
<tr>
<td>Miss-Ad-E3</td>
<td>Emerald</td>
<td>Adams Co., MS</td>
<td>raptor-fish-snake</td>
<td>MPM 16207</td>
<td>Glendon limestone</td>
<td>1c</td>
<td>Brain and Phillips 1996:387; Brown 1926:Figures 220, 226; West 1934:Plate 91.1</td>
</tr>
<tr>
<td>Miss-Ad-E5</td>
<td>Emerald</td>
<td>Adams Co., MS</td>
<td>panther</td>
<td>MPM 16209</td>
<td>Glendon limestone</td>
<td>1a</td>
<td>Brain and Phillips 1996:387; Brown 1926:Figure 221; West 1934:Plate 91.4</td>
</tr>
<tr>
<td>Miss-Ad-F2</td>
<td>Fatherland</td>
<td>Adams Co., MS</td>
<td>panther</td>
<td>MDAH 61.753.28</td>
<td>Glendon limestone</td>
<td>1h</td>
<td>Brain and Phillips 1996:386; Williams and Brain 1983:Figure 7.32a-c</td>
</tr>
<tr>
<td>Miss-Yo-LG1</td>
<td>Lake George</td>
<td>Yazoo Co., MS</td>
<td>panther</td>
<td>MDAH 60.342</td>
<td>Glendon limestone</td>
<td></td>
<td>Brain and Phillips 1996:386; Williams and Brain 1983:Figure 7.32a-c</td>
</tr>
<tr>
<td>La-Mo-SL1</td>
<td>Sycamore Landing</td>
<td>Morehouse Pa., LA</td>
<td>raptor</td>
<td>NMAI 17.2839</td>
<td>Glendon limestone</td>
<td>1g</td>
<td>Brain and Phillips 1996:387; Moore 1909:Figures 105–106; West 1934:Plate 97.2</td>
</tr>
<tr>
<td>Ark-Ga-HS1</td>
<td>(unknown)</td>
<td>Hot Spring Co., AR</td>
<td>panther</td>
<td>NMNH 88173</td>
<td>Glendon limestone</td>
<td>1d</td>
<td>Brain and Phillips 1996:387; McGuire 1899:Figure 158</td>
</tr>
<tr>
<td>Other Pipes</td>
<td>Miss-Ad-E4</td>
<td>Emerald</td>
<td>crouching man</td>
<td>MPM 16208</td>
<td>Glendon limestone</td>
<td>1j</td>
<td>Brain and Phillips 1996:385; Brown 1926:Figures 219, 225; West 1934:Plate 91.3</td>
</tr>
<tr>
<td></td>
<td>Miss-Wi-G1</td>
<td>Glass</td>
<td>crouching man</td>
<td>OCM</td>
<td>Glendon limestone</td>
<td>1k</td>
<td>Brain et al. 1995</td>
</tr>
<tr>
<td></td>
<td>Ala-Tu-M301</td>
<td>Moundville</td>
<td>pipe holder</td>
<td>PMAE 48120</td>
<td>Glendon limestone</td>
<td>1l</td>
<td>Moore 1905:Figures 1–3</td>
</tr>
<tr>
<td></td>
<td>Ala-Tu-M302</td>
<td>Moundville</td>
<td>frog</td>
<td>PMAE 48119</td>
<td>Glendon limestone</td>
<td></td>
<td>Moore 1905:Figures 2–3</td>
</tr>
<tr>
<td></td>
<td>Ala-Tu-M303</td>
<td>Moundville</td>
<td>pot</td>
<td>AlaMNH A936.1.203</td>
<td>Glendon limestone</td>
<td></td>
<td>Krebs et al. 1986:104</td>
</tr>
<tr>
<td></td>
<td>Ala-Tu-M338</td>
<td>Moundville</td>
<td>raptor</td>
<td>NMAI 17.894</td>
<td>Paleozoic limestone</td>
<td></td>
<td>Brain and Phillips 1996:316; Moore 1907:Figures 80–86; Moorehead 1910:II:Figures 477, 477A; West 1934:Plate 97.1</td>
</tr>
</tbody>
</table>

*These designations are the same as those of Brain and Phillips (1996). For each of the four pipes they do not discuss, we have created a unique designation following their conventions.

*AlaMNH = Alabama Museum of Natural History; MDAH = Mississippi Department of Archives and History; MPM = Milwaukee Public Museum; NMAI = National Museum of the American Indian; NMNH = National Museum of Natural History; OCM = Old Courthouse Museum (Vicksburg, MS); PMAE = Peabody Museum of Archeology and Ethnology (Harvard University); TSM = Tennessee State Museum.

*Pipe examined by Steponaitis only; Dockey confirmed the presence of *L. supera* from photographs.

*This pipe contains one likely fossil of *L. supera*. It also contains a mold of the bivalve *Pitar (Lamelliconcha) imitabilis* (Conrad 1848a, 1848b). This species is present in the Glendon limestone as molds and in the overlying Byram Formation as well-preserved shells.
Geological Provenance

Seventeen of the 18 pipes in our sample are made of exactly the same material—a cream-colored, fossiliferous limestone. Many kinds of fossils are visible in the surface, including pectens, gastropods, and Foraminifera. Of all the visible species, one is particularly important in linking the rock to a single geological deposit. This fossil is a Foraminifera called *Lepidocyclina supera*, and the geological deposit of which it is characteristic is called the Glendon limestone.

*L. supera* is a large species of Foraminifera, which are one-celled, amoeba-like creatures with calcareous shells (or “tests”) that live in marine environments. Most Foraminifera are microscopically small, with large varieties such as *Lepidocyclina* being the exception. Larger Foraminifera are
readily visible as fossils in ancient rocks. *L. supera* fossils tend to be thin, wafer-like, circular disks up to 10–18 mm in diameter (Figure 2).

They are usually seen in cross section, where they exhibit a thin lenticular profile, thickened in the center and often slightly bent. The cross section also invariably reveals a chambered internal structure that is highly distinctive (Cushman 1920; Ellis and Messina 1965).

The Glendon limestone, the geological formation for which *L. supera* is a guide fossil, is a marine deposit of early Oligocene age (Adams et al. 1926:285–287; Dockery 1980:57–61). On geological maps, it is generally considered part of the Vicksburg Group, which runs in a long, narrow arc southeast from Vicksburg, Mississippi, across southern Alabama, dipping into the Florida panhandle and then turning northeast into Georgia (Bicker 1969; Brooks 1982; Lawton et al. 1976; Szabo et al. 1988). Theoretically, the kind of limestone used in making the pipes might occur anywhere along this arc. But in reality, the range of likely sources is much more limited, because Glendon outcrops become less prominent as one moves along the arc from west to east. The largest and most accessible deposits of “pipe-grade” material are found in extensive outcrops that stretch for more than 30 km in the vicinity of Vicksburg, at the base of the towering loess bluffs that define the eastern edge of the Mississippi Valley (Figure 3). Here, the massive white outcrops are a prominent feature of the landscape, and more than 90 percent of the exposed limestone is Glendon. As one moves eastward, the Glendon deposits tend to become thinner and narrower, and the underlying Marianna limestone becomes much more prominent. For example, at St. Stephens on the Tombigbee River in Alabama, only about 13 percent of the exposed limestone section consists of Glendon, while 87 percent consists of Marianna. Moreover, the Glendon deposits from central Mississippi to southern Alabama take on a much more crystalline character, recognizably different from the softer material used to make the pipes we examined. Even farther east, beyond the Conecuh River, the Glendon limestone has been “completely altered” to form a cherty residual clay (Adams et al. 1926:286).

Thus, if one were to assign a probable source based on the abundance and availability of Glendon exposures, the most likely place is the region around Vicksburg. At this location, the large and obvious outcrops of Glendon limestone are exposed in the bluffs at and just above the level of the Mississippi’s floodplain (Figure 4). Where the Mississippi River touches the bluffs, the massive limestone deposits appear at the waterline. The Glendon limestone also commonly outcrops in the ravines along the bluff edge, where the ledge of

![Figure 2. *Lepidocyclina supera* fossils: (left) orthogonal views and cross sections—scale bar equals approximately 1 cm (after Cushman 1920:Plate 26; Ellis and Messina 1965); (right) cross section of *L. supera* fossil, indicated by an arrow, visible in the surface of pipe Ala-Tu-M91.](image-url)
Figure 3. Oligocene limestones in Mississippi and Alabama, shown in gray (after Bicker 1969; Dicken et al. 2007; Szabo et al. 1988). The Glendon limestone makes up a subset of these deposits, most prevalent at the western end of this distribution where the deposits are exposed at the edge of the Mississippi Valley.

Figure 4. Outcrops of Glendon limestone near Vicksburg, Mississippi: (left) in a ravine at Mint Spring, Vicksburg National Military Park; (right) on the bank of the Mississippi River, upstream from the I-20 bridge.
limestone typically creates waterfalls. Nowhere else are outcrops of this particular limestone so plentiful and easy to find. Macroscopically, the material in our pipes looks very much like the stone in these outcrops.

Two additional, independent lines of evidence can be brought to bear in support of this conclusion. Figure 5 shows the geographical spread of Bellaire pipes across the South. Note that Vicksburg is close to the center of this distribution, which is exactly what we would expect if the pipes originated there. Yet another line of evidence is stylistic. Three of the pipes made of Glendon limestone are decorated with incised scrolls like those found on the pottery types Leland Incised and Fatherland Incised, which are contemporary with these pipes in the Lower Mississippi Valley (see Figure 1f, h–i). The treatments at the center of the scrolls are especially distinctive: circles in two cases and a continuous-line meander in the third, both of which are common in Leland and Fatherland types (Hally 1972:718–760; Neitzel 1965:Figures 19–20; Phillips 1970:104–107; Williams and Brain 1983:Figures 5.83–5.84) but rarely occur in the scrolls found on contemporary Moundville pottery (Steponaitis 1983:Figures 45, 51–53, 62–63). Thus, the links to ceramic designs also point to the Lower Mississippi Valley as the most likely manufacturing locale for these Glendon limestone pipes, which include all the examples in our Bellaire group and five of the six other pipes we examined.

It remains for us to consider the one pipe in our sample that was not made of Glendon limestone: an unusual inverted-raptor effigy from Moundville, with the head wrapped around the side of the bird and the talons shown on top (Ala-Tu-M138). The
Discussion

The geological, distributional, and stylistic evidence indicates that all of the Bellaire pipes, as well as most of the other limestone pipes we examined, were manufactured in the Lower Mississippi Valley, probably somewhere in the region of Vicksburg. This conclusion has several interesting implications.

First and foremost, it resolves the uncertainty about where the Bellaire pipes were made. In the absence of information on geological provenance, researchers tend to assume that the place where the most objects of a particular type are found is also the place of manufacture. Most of the Bellaire pipes were found at only two sites, Emerald and Moundville, with equal numbers at both (Table 1). Moreover, all four of the Bellaire pipes at Moundville are the so-called cat pipes, which emphasize the feline characteristics of the depicted creature, and no other site has produced more than a single example of this particular form. Thus, it has long been assumed that Moundville was “home” to these pipes. This assumption has now been put to rest.

If one accepts this interpretation, yet another interesting question immediately presents itself: Why were so many pipes of this type found at Moundville, located at the far eastern edge of the type’s distribution and some 300 km from the Lower Mississippi Valley? Surely, this does not fit the expectations of the usual “distance-decay” model of decreasing frequency with increasing distance from the source. The answer, we believe, lies in two factors. One is simply the tremendous volume of excavation at Moundville, which would cause even rare artifacts to be found in much greater frequency than at sites where less dirt has been moved. But this alone does not explain the thematic consistency we see in the Moundville pipes. In other words, why so many “cats” relative to the other forms one sees in the Bellaire group? Here we may be seeing the outcome of deliberate selection. Effigy pipes were spiritually powerful objects with specific ritual uses and associations. We suspect that the ritual practitioners at Moundville sought out the pipes with powers that were important in their local religious sphere. The Underwater Panther depicted in these pipes was widely associated with the Beneath World in the native cosmos (Lankford 2007a), which fits perfectly with the emphasis on the Beneath World seen in the local art at Moundville (Knight and Steponaitis 2011; Steponaitis and Knight 2004).

Finally, our study has demonstrated the efficacy of using macrofossils to establish the geological provenance of limestone artifacts in the ancient American South. This simple technique has the advantages of being quick, inexpensive, and non-destructive, and it can be applied much more widely than it has been to date.

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Note

1. Given this setting, it is perhaps no coincidence that
Glendon limestone was chosen so often to depict the
Underwater Panther or Great Serpent, whom native peoples
of the Eastern Woodlands associated with waterfalls,
whirlpools, deep or turbulent water, and caves (Hudson
1976:130; Smith 1995). Indeed, not far south of where the
Glendon limestone is exposed along the banks of the
Mississippi today, near the mouth of the Big Black River,
the early French colonists encountered a large whirlpool that they
called Grand Gouffre, a name that survives today as Grand
Gulf (McDermott 1979:233). This whirlpool must have been a
major and persistent feature of the river, as it consistently
appears on French maps throughout the first half of the eigh-
teenth century (e.g., L’Isle 1702; Marigny de Mandeville
1743). There is no way to know, of course, whether it existed
in Mississippian times or where other such eddies may have
been located. That said, it is easy to imagine that any distinc-
tive rock outcrop located at the water’s edge near such a
whirlpool would have been regarded as having spiritual
power

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