Alligator Mound: Geoarchaeological and Iconographical Interpretations of a Late Prehistoric Effigy Mound in Central Ohio, USA

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*Alligator Mound is an animal effigy mound in central Ohio, USA. Since Ephraim Squier and Edwin Davis first recorded and mapped it in 1848, many have speculated regarding its age and meaning, but with remarkably little systematic archaeological investigation. Many scholars have assumed the Hopewell culture (*c. *100* BC–AD *400) built the mound, based principally on its proximity to the Newark Earthworks. The Hopewell culture, however, is not known to have built other effigy mounds. Limited excavations in 1999 revealed details of mound stratigraphy and recovered charcoal embedded in mound fill near the base of the mound. This charcoal yielded radiocarbon dates that average between* AD *1170 and 1270, suggesting that the Late Prehistoric Fort Ancient culture (*c. AD *1000–1550) made the mound. This result coincides with dates obtained for Serpent Mound in southern Ohio and suggests that the construction of effigy mounds in eastern North America was restricted to the Late Woodland and Late Prehistoric traditions. Ethnographic and ethnohistoric analogies suggest that the so-called 'Alligator' might actually represent the Underwater Panther and have served as a shrine for invoking the aid of supernatural powers.*

> Standing upon the head and looking to the south east, the eye surveys an expansive valley stretching for miles away, which for beauty and fertility is rarely excelled. Unknown centuries have passed since this symbolic pile was reared, and still it keeps its faithful watch over the consecrated soil where repose the silent ruins of one of the great central citadels of the Mound Builders.
>
> (J. & C. Salisbury 1862)

Alligator Mound (33Li5) is one of only two mounds in the State of Ohio, USA widely accepted as animal effigies, or more properly, zoomorphic geoglyphs (Figs. 1–3). Serpent Mound (Fig. 4) is the better known of the pair (Glotzhober & Lepper 1994). Some archaeologists have proposed that other structures of earth and stone in the region represent zoomorphic geoglyphs, but all are more or less problematic. For example, White (1986; 1987) interprets two low embankments of stone in the Little Miami River valley as serpent effigies, but their lack of sinuosity has prevented general acceptance of this conclusion. White (1996) and others also have claimed that two roughly V-shaped embankments at the Stubbs Earthworks constituted a serpent effigy. This claim, however, is not supported by the most reliable pre-restoration descriptions of the site (Whittlesey 1852, 8), nor is it subject to testing because the embankments in question have been totally destroyed by gravel mining. A number of authors have suggested that various irregularly-shaped Hopewell mounds (e.g. Mound D at the Stubbs Earthworks, the so-called 'Eagle Mound' at the Newark Earthworks, and Tremper Mound) represent animals, but these identifications are highly subjective and problematic. In contrast, no one seriously disputes that Alligator Mound was built to depict some long-tailed quadrupedal animal, but there is little consensus about what animal it represents.

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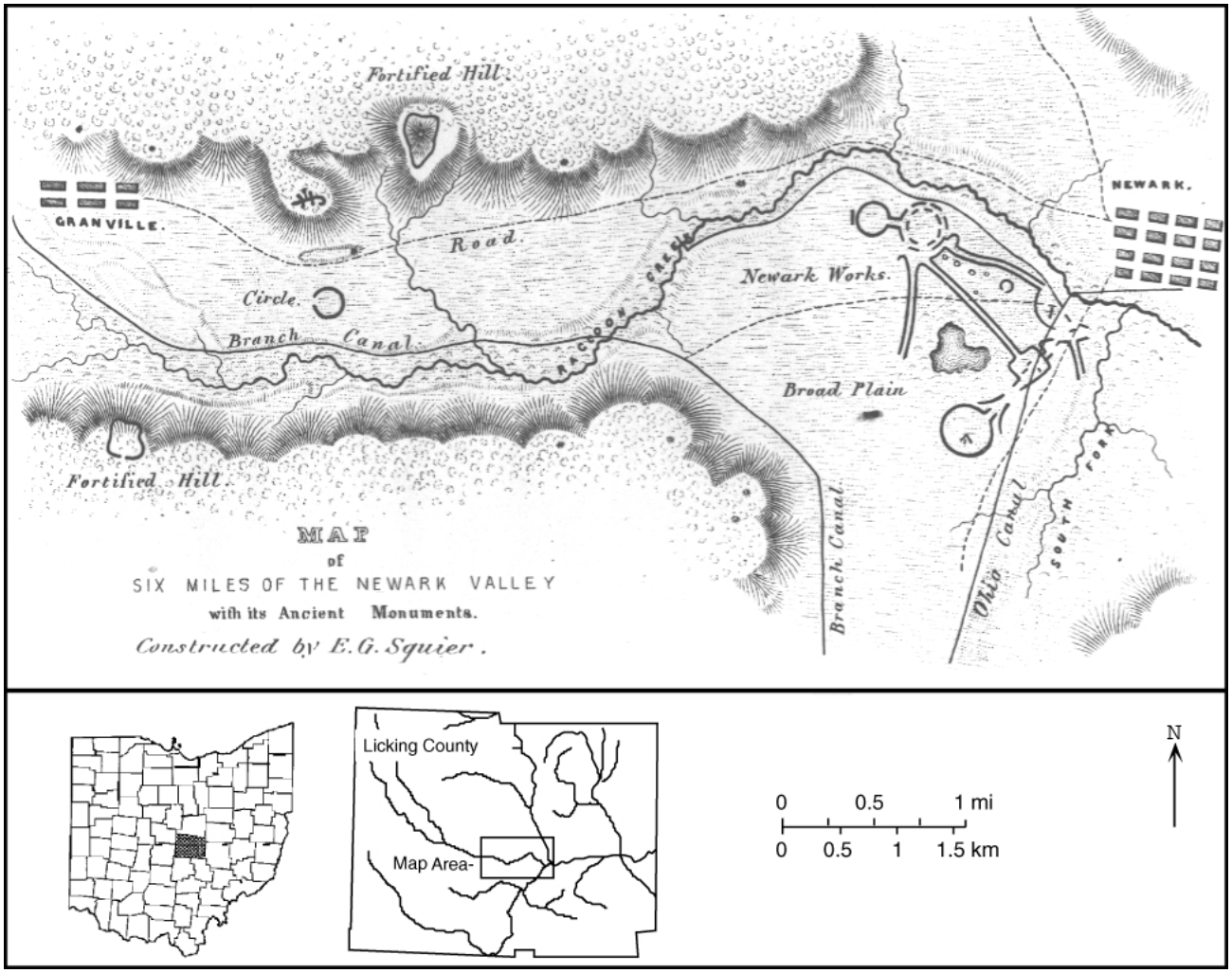

Figure 1. *Ephraim Squier and Edwin Davis' (1848) map of the lower Raccoon Valley between Granville and Newark, Ohio, USA showing the locations of Alligator Mound and the Newark Earthworks. Note that this sketch map does not accurately portray the area's upland or valley bottom terrain. (See the Granville and Newark, Ohio U.S.G.S. 7.5 Minute Series Topographic maps for details.)*

The purpose of this article is to review what is known about Alligator Mound and to report the results of geoarchaeological investigations undertaken to establish the age and, to the degree possible, the structure and composition of the effigy. We also attempt to infer aspects of the purpose and meaning of this zoomorphic geoglyph, but such efforts depend fundamentally on first establishing its temporal context.

Regional geologic framework

Alligator Mound lies on a southeast-trending upland spur on the north side of the Raccoon Creek valley between Granville (1.7 km to the west) and Newark (8.5 km to the east) in central Licking County, Ohio, USA (Fig. 1). The location may have been significant to its prehistoric builders in terms of terrain and the vista afforded by the bluff top, the availability of natural resources and the diversity of microenvironments in the immediate vicinity. The following overview of the regional geology situates this zoomorphic geoglyph in its landscape and provides the context for our subsequent analyses of the structural components of the effigy and the integrity of the deposits that comprise it.

The site lies within the Glaciated Allegheny Plateaus section (Brockman 1998) just 8–10 km inside (west) of the late-Wisconsinan ice maximum (Forsyth 1966; Pavey *et al.* 1999). To the west, the

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landscape flattens out as the substantial bedrock relief has been infilled with thick glacial deposits leaving gently undulating till plains (Frolking & Szabo 1998; Parkinson *et al*. 1992). To the east, the relief increases moderately as bedrock ridges become more prominent and glacial deposits thin and become increasingly patchy toward the eastern limit of Pleistocene ice. Without significant input of calcareous glacial sediment to the east of this margin, the soils of the Allegheny Plateaus are less productive and the diversity of forest vegetation decreases.

The local landscape reflects bedrock control in the uplands and steep valley sides and shows marked impacts of late-Wisconsinan glaciofluvial deposition on the lower valley side slopes and in the valleys. Interbedded siltstone and fine sandstone of the Lower Mississippian Cuyahoga Formation form lower valley sides and successive units of the overlying Logan Formation form the upper slopes and ridgetops (Bork & Malcuit 1979). Most sandstone units are thinly bedded with siltstone partings and weather to flaggy cobbles that are abundant in both residual slope material and in local glacial tills. This particular ridgetop extends southward into the main valley about 300 m farther than adjacent spurs and, when not forested, affords excellent views both up and down valley (see Fig. 1). The southeastern end of this spur rises southward from a gentle saddle to an oval prominence at about 328 m (1070 ft) elevation upon which the mound was constructed. The adjacent valley floor has been filled with glaciofluvial sediments to an elevation of 280 m (920 ft) yielding a local relief of about 50 m.

Silty glacial diamict (primarily till) discontinuously mantles the ridgetop. One exposure about 50 m north of Alligator Mound revealed a silt-loam mantle over about 0.6 m of leached, yellowish-brown, silty clay loam glacial till over a channery mantle of residual sandstone. Bedrock was quarried historically immediately south of the mound suggesting an absence of glacial deposits there. Steep valley sideslopes, such as those downslope from the mound, are typically mantled by shallow, bedrock-derived, channery residuum. Active eolian sedimentation and reworking in the late-glacial period undoubtedly contributed to the silt-loam topsoil found in most of the area's soils. Thus, the materials available locally for mound construction included: 1) flaggy sandstone cobbles; 2) loamy glacial till with abundant local and regional siltstone, sandstone and carbonate clasts in addition to some erratic igneous and metamorphic clasts; and 3) silt-loam topsoil, generally with relatively few clasts.

Archaeological history

Squier & Davis (1848) were the first to publish a description of this effigy mound. They noted that it was 'known in the vicinity as the "Alligator"', but admitted they found little to recommend that designation (1848, 99). At the time Squier & Davis surveyed the mound, it was 250 feet (76 m) long 'from the point of the nose following the curve of the tail to the tip' (1848, 99). It apparently was not then being cultivated and they estimated the average height as 'not less than four feet' (1.2 m) and six feet (1.8 m) at the shoulders (1848, 99). An 'altar', or 'elevated circular space, covered with stones which have been much burned', was connected to the north side of the effigy by a 'graded way, ten feet broad' (1848, 99). Squier & Davis observed that the 'earth has been excavated at various points' on the effigy, 'but nothing was disclosed except the fact that the framework is composed of stones of considerable size. The superstructure is of fine clay, which seems to have been brought from a distance, as no signs of excavation are apparent in the vicinity' (1848, 99).

Squier & Davis remarked that a stone quarry recently had been opened in the hillside south of the Alligator, downslope from its left front limb, and threatened to undercut the mound. Squier & Davis happily added in a footnote that they had succeeded in convincing the owner 'to permit no further encroachment upon it' (1848, 99). They expressed their hope that 'the citizens of Granville' would 'adopt means to permanently and effectively secure it from invasion' (1848, 99).

In 1858, William Pidgeon published the *Traditions of De-Coo-Dah and Antiquarian Researches*. As the title suggests, the work is a strange mixture of archaeological research of dubious merit and apocryphal (and likely fraudulent) Native American oral traditions (Lewis 1886; Williams 1991; cf. Salzer 1993). Pidgeon asserted that he had 'examined by excavation' a total of 92 effigy mounds in the Mississippi valley, including the Ohio Serpent and Alligator. Pidgeon stated that the 'interior structure' of the Alligator was composed of stones and that it was unique among effigy mounds in that the stones showed 'marks of order in its arrangement' (1858, 243). The differences were overshadowed, however, by a set of similarities with the great Serpent effigy, including their positions on topographic prominences and the presence of 'altars' of stone. For Pidgeon, these characteristics indicated an 'identity in classification and national origin' (1858, 287).

David Wyrick, formerly the Licking County Sur-

veyor, surveyed the mound in 1860 and may have conducted some excavations. He believed that the mound did not resemble an alligator, but was 'more like a panther sprawling upon the surface of the earth' (Bickham 1860). Bickham, summarizing Wyrick's work, wrote that the Alligator was 'a strongly defined embossment of *stone*, covered with earth' (1860).

In 1862, local antiquarians James and Charles Salisbury re-surveyed the effigy mound. They concurred with Wyrick that the effigy was 'undoubtedly intended to represent the Panther, King of the American forest; of which it may be regarded a good earth embossed representation' (Salisbury & Salisbury 1862, 22). By the time the Salisburys visited the effigy, the plough had 'been suffered to pass over this mysterious mound consequently reducing its hight [sic.] which is from 6 to 5 ft.' (1862, 22).

Warren K. Moorehead became familiar with Alligator Mound while a student at nearby Denison College. By this time a part of the left front paw had collapsed into the abandoned stone quarry. Moorehead interviewed the men who had worked the quarry and they reported that 'bones and charcoal were found during the excavations' (1885, 2). Moorehead did not specify, and it cannot now be determined, whether these bones were human or faunal remains, nor is it clear whether the bones represent material originally deposited within the mound itself or along the southern slope of the bluff. Moorehead examined the 'altar' and reported that it was 'scarcely three feet wide and a foot high' and its surface was covered with 'numerous burned stones' as well as 'charcoal and ashes' (1885, 2). He noted, however, that 'upon digging into the "altar" no traces of burnt clay or charcoal were found' (1885, 2). Therefore, fires had burned upon the surface of the altar; the stone platform did not cover the remains of a crematorium.

Daniel Brinton visited Alligator Mound in 1884. He asserted that it was 'not a mound at all' but rather 'a design cut in high relief in the soil of the projecting brow of the hill' (1885, 2). He based this conclusion on his observation of 'the character of the earth thrown out from several excavations, and from the cross section of the fore-leg' exposed as a result of the undermining of the effigy by the stone quarry (1885, 2). Brinton noted 'traces of long continued firing' on the stone altar and concluded that 'large fires have been maintained there at frequent intervals' (1885, 2). He also expressed his opinion that the effigy was 'certainly not an alligator' (1885, 2).

In 1887, George Frederick Wright was appointed by the Ohio Archaeological and Historical Society to evaluate the condition of Ohio's prehistoric earthworks and to consider 'the necessity and means' of preserving them. At that time, Alligator Mound was 'still in pretty good condition' (1888, 337):

> But one of the most vivid things in my memory is the picture of the sheep, cattle and horses which I saw stamping flies under the shade cast by a solitary tree upon the Alligator Mound. Their busy hoofs will not long suffer any remnant of it to continue visible. (Wright 1888, 337)

Unfortunately, the Society took no action at that time to preserve the effigy.

According to Hooge (1993, 144), Frank Carney, a professor of geology at Denison University from 1904 until 1917, conducted an extensive excavation of Alligator Mound. Carney is said to have 'excavated a long trench along the axis of the mound's body between the head and the tail' (Hooge 1993, 144). Unfortunately, Hooge was not able to locate any documentation relating to what Carney might have discovered. Alligator Mound was listed on the US National Register of Historic Places in 1971. The application form confidently asserts that the

> Alligator Effigy Mound was built by the Hopewell people and was probably associated with the Newark Earthworks . . . If indeed it represents an alligator, the mound gives additional credence to the wide contacts which the Hopewell people had on the continent (Porter 1971, 3).

In 1974, Donald Valdez of Denison University and Jack Bernhardt of Baruch College in New York observed numerous fragments of 'cut sheet mica' in the back dirt of a woodchuck burrow dug into the right side of the effigy just behind the right front limb (Bernhardt 1976, 52; Stallings 1981). According to Bernhardt, the fragments totalled 32.3 cm^2 of mica mixed with 'diffuse fragments of charcoal and fire-cracked rock' (1976, 52). Bernhardt concluded that the recovery of this mica 'tentatively identifies the mound as Hopewell' (1976, 52). The lack of clear provenience for this material, however, and the fact that 'small sheets of mica' continued to be used in ritual contexts through the Late Woodland period in Ohio (Seeman & Dancey 2000, 599) render this attribution less certain.

Paul Hooge, formerly a local resident and director of the Licking County Archaeology and Landmarks Society, studied Alligator Mound from 1983 (Hooge 1992; 1993). He initiated efforts to preserve the effigy when a developer acquired the property. Working with Hooge, William Dancey of Ohio State University undertook limited testing of the remains

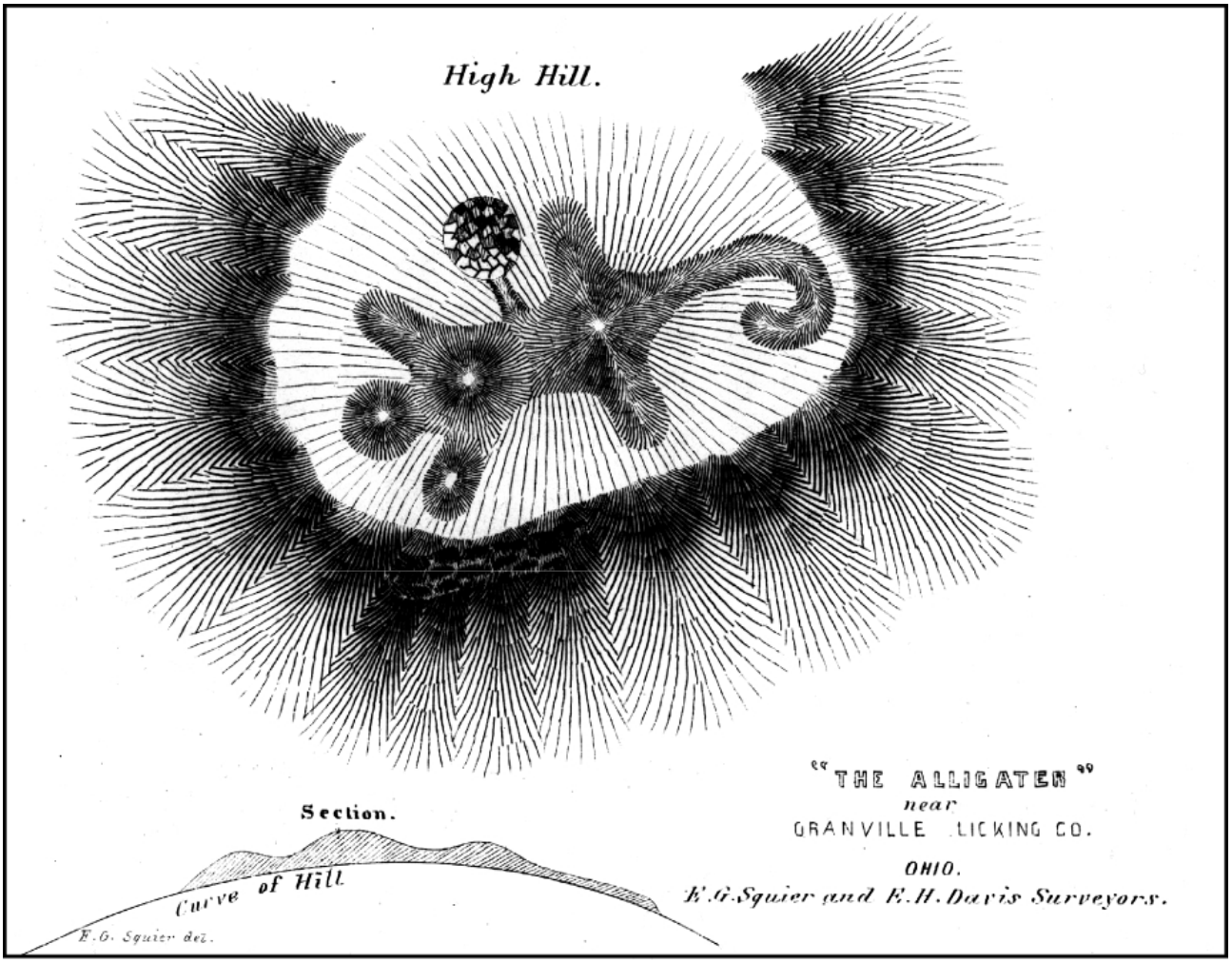

Figure 2. *Squier & Davis' (1848) plan view and cross section of Alligator Mound. This is the earliest documented rendering of the effigy.*

of the Alligator's stone 'altar' (see map showing the location of the test pit: Hooge 1993, 162). Unfortunately, beyond the brief note in Hooge's dissertation that the excavators found 'no large stones' in the test unit (Hooge 1993, 156), the results of this excavation have not been published.

Due, in part, to Hooge's efforts at public education, archaeological research, and preservation, the developer donated the mound to the Licking County Historical Society in 1991. The development proceeded, however, and the mound today is surrounded by an upscale suburban neighbourhood.

The antiquity of Alligator Mound

Alligator Mound traditionally has been considered to be a Hopewell effigy based almost exclusively on its proximity to the Hopewellian Newark Earthworks (e.g. Porter 1971; see also Pacheco 1996, 25; see Fig. 1), although as already noted the recovery of mica fragments from a woodchuck burrow also has been used to support this attribution (Bernhardt 1976; Stallings 1981). The Hopewell culture, however, is not known to have built any similar effigy mounds and the use of mica is not restricted to the Middle Woodland period. Nor was the mica recovered from a secure context. It might have originated in submound deposits or it might have been incorporated fortuitously in mound fill.

The archaeological landscape of the Raccoon Creek valley is a palimpsest with evidence of occupations ranging from Palaeoindian through the historic periods. If spatial proximity is the sole criterion for establishing affinity, then an equally compelling case could be made for other cultures known to have built mounds. A number of lines of evidence suggest

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the Late Prehistoric Fort Ancient culture (*c.* AD 1000–1550) created the effigy.

Although Alligator Mound is located on the northern periphery of the Fort Ancient culture area, there is a substantial Fort Ancient occupation (33Li228) in the valley to the south and east of the bluff on which the Alligator was built. There are, moreover, a number of Fort Ancient sites in neighbouring Muskingum County (Carskadden & Morton 2000). The mere proximity of these sites cannot demonstrate that they are related to Alligator Mound, but they do provide an alternative source for builders and users of the effigy.

Drooker has noted the similarity between Alligator Mound and the 'lizard- or salamandarlike applique figures' found on many Fort Ancient pottery vessels (1997, 325–6; see also figs. 8–40, p. 330), including one from the Philo II site in Muskingum County (Carskadden & Morton 2000, 170). This 'symbolic continuity expressed in different media' (Drooker 1997, 326) suggests a cultural connection.

While rare in Ohio, effigy mounds are quite common in the upper Mississippi valley. In Wisconsin, the 'heartland of the so-called effigy mound culture' (Birmingham & Eisenberg 2000, 110), between two and three thousand effigy mounds were built from AD 700 to 1200 (Birmingham & Eisenberg 2000, 109). According to Goldstein (1995, 105), 'birds, panthers, bear or buffalo, turtles, and lizards are among the most prevalent effigy forms'. Hall discerned a connection between the forms of the effigy mounds and the principal inhabitants of the upper and lower worlds of Eastern Woodland Indian cosmology: 'Effigy mounds . . . represented the division of the world into the earth/water and sky divisions' (Hall 1993, 51). Hall (1993, 43) identified long-tailed panthers, turtles, and lizards as representations of water spirits — or Underwater Panthers — and the birds as Thunderbirds — the traditional enemies of the Underwater Panthers (e.g. Landes 1968).

Birmingham & Eisenberg observed that most effigy mound groups in Wisconsin and neighbouring areas are 'located on high ground, bluffs, or terraces overlooking major rivers, streams, lakes, and large wetlands' (2000, 111). Goldstein noted that one of the most common features of midwestern effigy mounds is the 'fireplace or altar' usually made from stone and often occurring 'in prominent parts of the effigy form, such as the heart or head area' (1995, 106; see also Gartner 1999, 680). The Ohio Serpent and Alligator are situated on prominent bluffs overlooking streams and both have 'altars' of stone associated with them. Serpent Mound (Fig. 4) had a stone mound within the oval embankment that Fletcher and colleagues interpret as the serpent's eye (Fletcher *et al.* 1996, 134). Squier & Davis (1848, 97) described this as a 'small circular elevation of large stones much burned'. The Alligator Mound 'altar' of stones also exhibited evidence of much burning. These similarities suggested to Pidgeon (1858, 287) that these mounds shared an 'identity in classification and national origin'. The fact that they also share these characteristics with the effigy mounds of the upper Mississippi valley suggests they have some relationship with these more numerous geoglyphs — in spite of the great distance intervening between them.

It is remarkable that only Pidgeon has drawn attention to the possibility of a connection between Ohio's only two effigy mounds. Traditionally, Serpent Mound has been attributed to the Early Woodland Adena culture (*c.* 800 BC–AD 100) based on the proximity of two Adena burial mounds, but there is also a Fort Ancient mound and the remains of a substantial Fort Ancient village in the immediate vicinity of the effigy (Fletcher *et al.* 1996). In 1996, Fletcher and others reported the first radiocarbon dates from the Serpent. Two charcoal samples yielded identical dates of 920±70 years BP (Beta-55277, CAMS-3566) and 920±70 years BP (Beta-55278, CAMS-3567) (cal. AD 995–1265). It is worth noting that the Kern stone effigies date to this same period and that the time-span of the Fort Ancient culture overlaps the end of the Effigy Mound culture in the upper Mississippi valley. A Fort Ancient attribution for Alligator Mound would, therefore, be broadly consistent with the radiometrically-determined ages of every other dated effigy mound in eastern North America.

In 1994, a landscaping crew inadvertently truncated the Alligator's left forelimb; the same limb that had been undermined and partially truncated in the nineteenth century. Lepper, the senior author, examined the fresh cut through the effigy within a few days of the accident. The profile revealed 5 to 15 cm of apparently intact mound structure. It consisted predominantly of fire-altered angular sandstone cobbles and silt loam stained dark brown with charcoal. The contact between mound fill and the much lighter brown subsoil appeared clear and distinct. Lepper collected a sample of the sediment and Dee Anne Wymer of Bloomsburg University undertook a flotation analysis recovering small amounts of charcoal including 0.04 grams of wood charcoal and two small fragments of charred nutshell. Radiocarbon dating of the wood charcoal yielded an age of 340±60 years BP (Beta-85517). This age determination was not con-

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sidered to be definitive because the shallow depth of the deposit indicated that the sample was vulnerable to contamination from historic era cultivation, as well as bioturbation. The extensive charcoal staining observed in the matrix of the effigy suggested that an excavation into undisturbed parts of the mound likely would yield abundant datable materials with a more secure context.

Methods

Given the abundance of charcoal and fire-cracked and fire-altered rock observed in the truncated left forelimb, we believed that a limited excavation into a previously undisturbed portion of the effigy would enable us to obtain charcoal suitable for radiocarbon dating. Permission was accordingly sought and obtained from the Licking County Historical Society for a one-day investigation of Alligator Mound with the primary goals of: 1) obtaining organic carbon for radiocarbon dating to ascertain the age of the structure; and 2) examining the sediments and stratigraphy of the mound to help elucidate its method of construction. A series of 1 × 1-metre units was hand excavated using shovels, picks, and trowels into the south flank of the mound just east of the southwestern appendage (Fig. 5). This part of the effigy was close enough to the left forelimb to increase the likelihood that the stratigraphy would be similar and of sufficient relief to ensure that plough disturbance would not have penetrated through the entire deposit. In addition, we excavated a small test pit (approximately 70 cm long × 40 cm wide × 70 cm deep) into the top of the mound along the axis at the shoulders (3.7 m north of north wall of trench).

Given time constraints, description of stratigraphic units and soil

Figure 3. *Aerial photograph of Alligator Mound,* c. *1928. This is the earliest documented aerial photograph of Alligator Mound. It was taken by Warren Weiant, Jr of Newark, Ohio.*

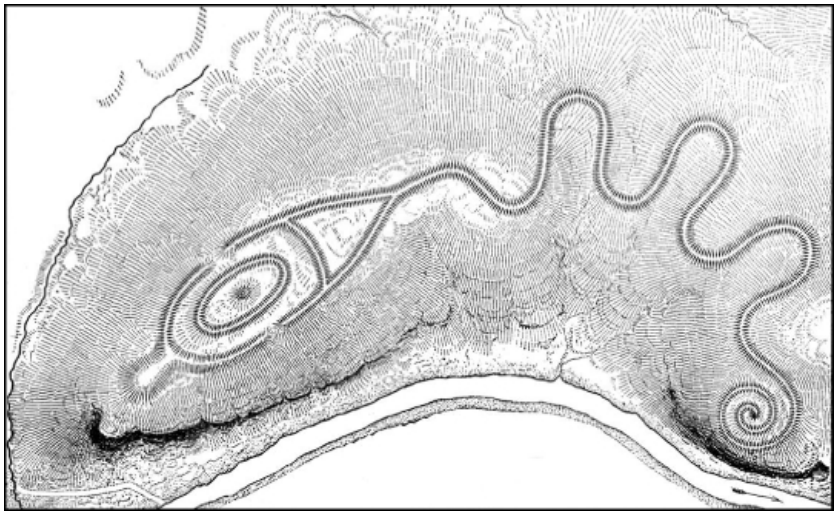

Figure 4. *W.H. Holmes' (1886) sketch of the Great Serpent Mound, Adams County, Ohio, USA. The 411-m-long (1348 ft) Serpent Mound arguably is the most famous effigy mound in North America. Most renderings fail to depict the earthwork between the northwestern end (left on figure) of the oval embankment and the bluff edge. The oval enclosure usually is interpreted as an object, an egg for example, in the serpent's open jaws and, from this perspective, the additional earthwork is anomalous. An interpretation more consistent with the evidence, and corroborated by a comparative analysis of other Late Prehistoric-era artistic representations of serpents, is that the oval is the stylized eye of the serpent while the anterior earthwork is the serpent's snout (Fletcher* et al. *1996).*

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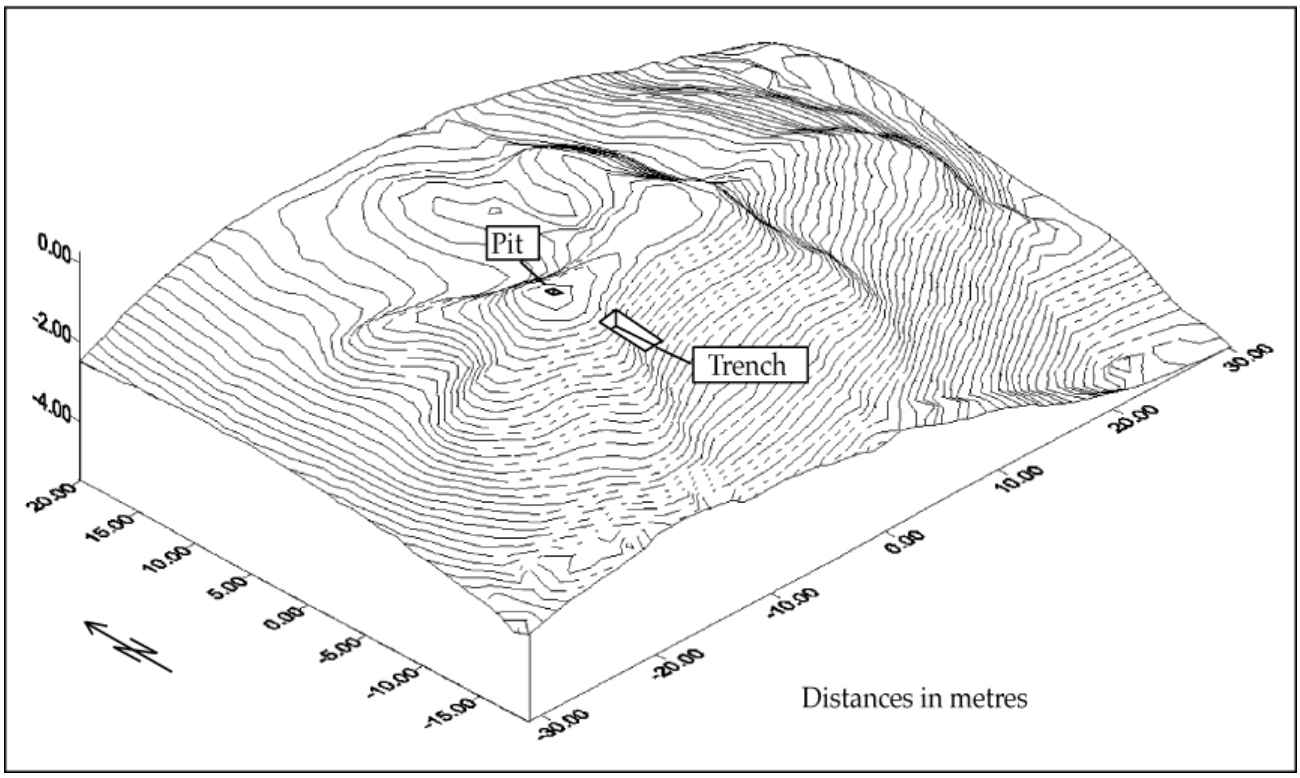

Figure 5. *Digital elevation model of Alligator Mound with 0.5 m elevation contours based on 1995 survey by R. Fletcher, W. Pickard, L. Pahdopony, and L. Peddicord, showing locations of the 1999 excavations of the 4 × 1 m trench and the 30 × 60 cm test pit on the effigy's upper back.*

profiles in the field were done rapidly. Soil survey procedures and nomenclature were followed to the degree possible (Soil Survey Staff 1975). Three samples were taken from the east face (EF) of the trench at 1.4 m in a silty unit underlying the rock-rich surface layer. Six samples were taken from the central section of the 1-m-wide north face (NF) of the trench. Six samples were taken from the east face of the small central pit dug along the mound's apex at the shoulder (CP) and five additional samples were taken by coring into the base of the pit with a bucket auger. More careful observations of samples were made in the lab using both hand lens and binocular microscope (10–35X). Particle size analysis followed standard pipette procedures (Gee & Bauder 1986). The fine clay fraction percentages were determined using centrifugation and pipette extraction.

Contrary to the expectations we had developed as a result of our examination of the profile of the truncated left forelimb, visible charcoal was not abundant. We observed none until we had extended the excavation trench nearly four metres into the effigy. While clearing the area surrounding a small mound of stones situated on what appeared to be the floor of the mound 1.07 m below the surface, excavators encountered two small fragments of charcoal 2–3 cm apart firmly embedded in the sediment matrix. They were removed by trowel and placed in aluminum foil packets with a small amount of the surrounding sediment. We also collected a bulk sample of sediment for a soil humates radiocarbon date from Stratum III, at a depth of between 50 and 55 cm, immediately below several flat sandstone cobbles (Fig. 6). We believed this mantle of rocks would have shielded the sample from contaminants that might have been present in water percolating through the soil column.

Results

Mound composition

All materials unearthed in the excavation could have been obtained in the immediate environment (i.e. ridgetop and shoulder slope). The fine fraction (<2 mm) of all samples from the mound showed a surprising degree of textural uniformity, all having silt-loam textures typical of shallow zones of local soil profiles (Table 1). The sand and silt percentages were very

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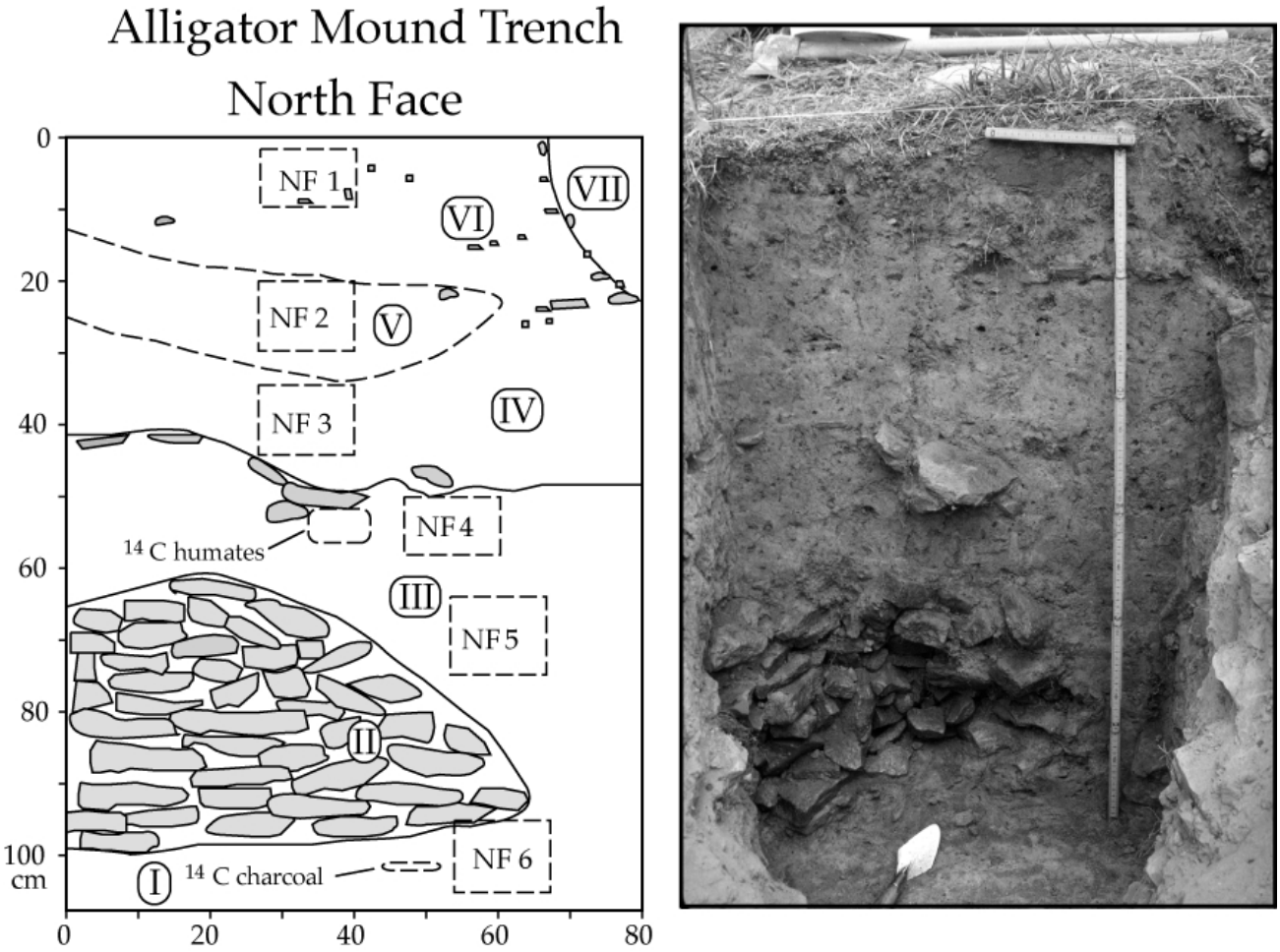

Figure 6. *Diagram and photo of north face (AM–NF) of excavation showing stratigraphic units (roman numerals), locations of samples taken for particle size analysis (NF 1–6), and approximate locations of samples taken for radiocarbon analysis (^{14}C).*

similar for all mound samples. The mean average clay and fine clay contents for the trench north face and test-pit profiles were also quite similar, indicating a similar source for mound fill. The systematic changes in both the total clay and fine clay fractions vertically are most likely due to post-construction pedogenesis (see discussion below).

From these two profiles, which admittedly might not be representative of the entire mound, it appears that the effigy was constructed of silt loam topsoil (A, E and perhaps some BE horizon material). Because most modern upland soils have undergone significant erosion following European settlement, forest clearing and agriculture (Parkinson *et al*. 1992), it is difficult to assess the textures of topsoil available at the time of mound construction. Several observations can be made that help to narrow the range of possible materials used in construction. First, all well-drained, silt loam soils in the area have significant accumulations of clay in B horizons, with clay percentages typically greater than 20 per cent within a depth of 30–40 cm from the surface. There was no evidence of this argillic material in the mound itself in terms of either high clay content or well–developed relict argillans. This indicates that shallow soil material was used in construction. Second, modern soils on valley side slopes (Mechanicsburg & Bownsville series) have higher sand percentages than the mound material due to the abundance of sandstone cobbles near the surface. This suggests little if any topsoil was brought upslope for mound construction. On the other hand, the piles of relatively loosely-packed, flaggy sandstone clasts within the mound (see Figs. 5 & 6) suggest that rocks were collected from the upper sideslope because few clasts are naturally exposed near the soil surface on the ridgetop.

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Table 1. *Sample depths, moist soil colour (Munsell notation) and particle size data for samples from the east face (EF), north face (NF), and centre pit (CP).*

Sample	Depth cm	Stratigraphic unit	Matrix Munsell colour	Texture	Coarse* >2 mm	Sand 2 –.062 mm	Silt 62–2 um	Total clay <2 um	Fine clay <0.2 um	Fine/Total clay
EF-1	15–22	VI	10YR 4/3	sil	7.9	12.0	77.1	10.9	1.7	0.15
EF-2	30–33	IV	10YR 5/4	sil	6.3	10.8	73.0	16.2	4.1	0.25
EF-3	40–45	IV	10YR 5/4	gsil	28.2	11.4	69.4	19.2	6.1	0.32
NF-1	2–10	VI	10YR 4/2.5	sil	6.3	12.7	78.0	9.3	1.5	0.16
NF-2	20–30	V	10YR 4/4	sil	4.8	9.6	76.7	13.8	3.0	0.22
NF-3	35–45	IV	10YR 4/4	sil	3.9	8.6	75.4	15.7	4.1	0.26
NF-4	50–58	III	10YR 4/4	sil	6.9	8.6	74.2	17.2	5.0	0.29
NF-5	64–75	III	10YR 4/4	sil	3.7	7.9	74.5	17.6	5.7	0.32
NF-6	95–105	I	10YR 5/4	sil	5.1	11.2	73.9	14.9	4.4	0.30
	mean mound profile values **					9.7	75.4	15.0	4.1	0.27
CP-1	4–15	–	10YR 4/3	sil	12.7	12.7	76.1	11.3	2.6	0.23
CP-2	20–28	–	10YR 4/4	sil	5.6	12.0	74.3	13.7	4.0	0.29
CP-3	30–38	–	10 YR 4/4	sil	12.8	11.3	72.7	16.0	4.9	0.30
CP-4	40–48	–	10 YR 4/4	sil	2.0	9.2	74.0	16.8	6.0	0.36
CP-5	50–58	–	10 YR 4/4	sil	3.2	9.0	74.0	17.0	6.0	0.36
CP-6	60–68	–	10 YR 4/4	sil	1.5	8.4	75.0	17.0	6.0	0.35
CP-7	70–78	–	10 YR 4/4	sil	2.1	8.7	77.0	14.3	4.6	0.32
CP-8	78–82	–	10 YR 4/4	sil	4.5	9.3	76.1	14.6	4.3	0.30
	mean mound profile values					10.1	74.9	14.8	4.6	0.31
CP-9	90–95	–	8.5YR 3/3–4/4	sicl	0.6	4.8	67.4	27.8	15.0	0.54
CP-10	100–105	–	8.5YR 4/4	sil	0.4	4.8	70.2	25.0	12.5	0.50
CP-11	110–120	–	8.5YR 4/4	sil	1.6	5.4	71.9	22.6	11.5	0.51

* Coarse fraction not included in calculations of percent sand, silt and clay.
** Values represent weighted profile means corrected for sampling intervals.

Some samples, particularly EF-1 and EF-2, showed evidence of mixing of material from different soil horizons with fine peds of 10YR 3/2 material incorporated within a lighter matrix. It appears as though lighter-coloured material may represent infilling around darker loosely-packed material. This could have occurred during construction or perhaps subsequent bioturbation. Most samples, however, showed little evidence of variegation or mixing of different textured materials.

These results conclusively refute Brinton's notion that the mound had been 'cut in high relief in the soil of the projecting brow of the hill' (1885, 2). Clearly, Alligator Mound was formed predominantly by adding material to the prepared hilltop rather than subtracting from it.

Mound stratigraphy

At the central test pit, the base of the mound rests disconformably at a depth of 85 cm on an argillic B horizon developed in a parent material different from the mound fill (Table 1). Material from 85 to 120 cm has low coarse fraction and sand content and markedly more clay and especially fine clay than the overlying mound material. The material has a stronger brown colour, many moderate dark brown (8.5YR 3/2–3) argillans, and an almost lamellar structure in the upper zone. This material probably represents a localized zone of fine sediment in a sedimentologically-variable glacial diamict. The auger was stopped at 120 cm by a large clast. It is not clear at what depth this material would have resided in a pre-mound soil, but most likely at a depth greater than 40 cm given the abundance of clay films. At this location, the pre-mound surface was stripped down to the B horizon before construction. In all likelihood, this stripped material was then incorporated (reformed) into the mound. Unfortunately, the entire profile encountered in the trench on the flank of the mound was constructional material, so a broader interpretation of the preparation of the substrate is not possible.

Stratum I is a silty deposit that we presume to be at or very near the base of the mound construction; comparable in texture to material at a depth of 70–85 cm in the central test pit (Fig. 6 & Table 1).

Stratum II is a small mound or pile of stones nearly 40 cm high and probably 90 to 100 cm in diameter (the entire profile was not exposed). The

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stones are loosely piled, angular sandstone cobbles with surprisingly little interstitial sediment. The small test unit placed along the spine of the effigy exposed a portion of another spatially-discrete stone pile. These results tend to corroborate Pidgeon's observation that the Alligator had 'an interior structure of stone works bearing marks of order in its arrangement' (Pidgeon 1858, 243). Although much of Pidgeon's work is acknowledged to be 'fantastic' (Williams 1991), Salzer (1993) has argued that the now evident nonsense is attributable to hucksterism that overlies a corpus of more or less accurately recorded oral traditions. Our results similarly suggest that Pidgeon also may have done some creditable archaeology, but, of course, we do not recommend that any of his statements be accepted uncritically.

Stratum III is a zone of slightly browner and clay-enriched silt loam that showed a coarse blotchy gray-brown appearance on the pit face. It is capped by a discontinuous facing of flat, angular sandstone cobbles. The contours of this stratum appeared to follow the contours of the underlying stone mound. The fact that the underlying stone pile had no significant infilling of fine sediment suggests this stratum may have been deposited over the stones in a moist, cohesive state.

Strata IV, V and VI were distinguished in the field through slight differences in colour that are probably related to pedogenesis and post-settlement mound disturbance rather than significant differences in construction material or method (Figs. 5 & 6). Stratum V appeared darker greyish brown than Stratum IV on the pit face, suggesting a somewhat different source material. No significant differences in composition or soil structure were noted under microscopic analysis. Stratum VI may be a very poorly-defined plough zone. It lacks an abrupt lower boundary and numerous clasts extend down into Stratum V. If, in fact, the mound surface was ploughed, it was not ploughed repeatedly.

Stratum VII is a zone of mixed sediment and cobbles. We interpret it as a back-filled excavation pit that postdated the evident cultivation of the mound. Both Squier & Davis (1848) and Pidgeon (1858) refer to excavations having been conducted into the Alligator. Cultivation of the effigy is not specifically mentioned until 1862 (Salisbury & Salisbury 1862, 22).

Post-construction pedogenesis

Both the north-face profile and the test pit showed clear evidence of post-construction pedogenesis, principally clay and particularly fine clay illuviation (Table 1). Total clay percentages increased from 9–13 per cent in the upper portion of the mound (0–30 cm) to 16–17 per cent through a depth of 30–70 cm and then dropped off slightly below. While these differences appear minor, they are consistent between profiles. The more mobile fine-clay fraction showed a relatively larger change through the profiles. Common thin brown 7.5YR 4/4 ferriargillans were observed along root pores and fine ped surfaces in the illuvial zones. In a few instances, clay coatings appeared to drape across variegated material, indicating that clay translocation post-dated the mixing of material.

The B horizon marginally meets the requirements of an argillic (Bt) horizon in the US Soil Taxonomy (Soil Survey Staff 1988). The illuvial horizons in the trench and pit profiles have at least 3 per cent more clay than the eluvial horizon and notably higher fine/total clay ratios (Table 1). The weak fine to medium subangular blocky structure noted in the samples was not well expressed in the field. The distribution and orientation of argillans on pore walls and ped surfaces was not measured in the field.

The modest degree of pedogenesis appears to be in line with the nature of the parent material and the age of the mound. The mound was constructed of eluvial soil material (A and E horizons) and hence was relatively deficient in clay by comparison with the typical mean clay content of soils in the area. Given that the material was already leached of clay-stabilizing carbonates, 800 years would seem to be sufficient time for this modest degree of clay translocation to occur. The clay bulge is of a similar magnitude to that in a low Early Woodland mound at the nearby Munson Springs site (Frolking & Lepper 2001), although not directly comparable because of the midden component at that site. Ranging more broadly to constructed mounds with somewhat different climates and parent materials, the crest of the higher and steeper 2100-year-old Woodland Cotiga Mound in southwest West Virginia showed more strongly developed soil profiles with thicker argillic horizons (Cremeens 1995). Parsons *et al.* (1962) found that soils formed in effigy mounds in eastern Iowa had developed incipient argillic horizons. More recent work by Bettis (1988) determined that B horizons in soils on the 1650-year-old Keller and Bluff Top Mounds in Iowa did not meet the argillic criteria and were classified as inceptisols.[1]

The clay maxima at depths of 50–70 cm in both the central pit and trench face profiles do not indicate substantial erosion of material from the mound surface. Significant soil profile truncation during the

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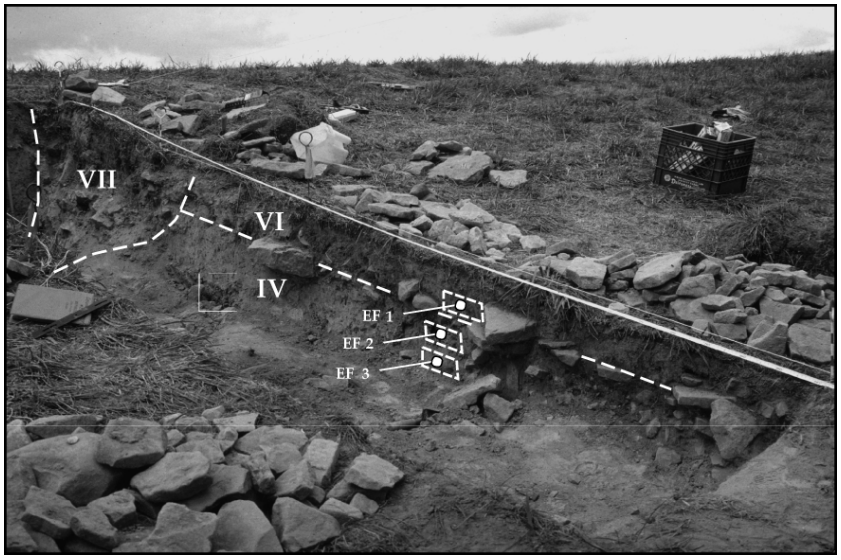

Figure 7. *Photo of east face (AM–EF) of excavation with stratigraphic units and soil sample locations indicated. Note abundance of angular, flaggy sandstone clasts.*

agricultural period would have resulted in a shallower depth for the clay maxima. Therefore, contrary to the dire predictions of Wright (1888, 337), we conclude that the post-settlement erosion of the mound surface has been at most 10–25 cm.

Radiocarbon dating

The samples of wood charcoal recovered from the mound (see Fig. 6) were sent to Dee Anne Wymer of Bloomsburg University for identification. During the excavation, shipment, and processing of these samples the two discrete pieces of charcoal fragmented into a number of smaller pieces, but the integrity of the two samples was maintained for the purposes of analysis and subsequent dating. Wymer isolated 0.14 g of wood charcoal from the first sample and 0.31 g from the second. The first sample included fragments of oak (*Quercus* sp. White group) and the second sample included a few specimens identifiable only as 'ring porous; probably oak' (Dee Anne Wymer pers. corres., 16 September 1999). White oak would have been a major component of the vegetation on this south-facing bluff during the Late Prehistoric and early historic periods (e.g. Gordon 1969, 47–54), so its presence in the sample is not inconsistent with a prehistoric context. The first sample yielded a date of 820±40 years BP (Beta-134236) and the second an age of 840±40 years BP (Beta-134237) (Table 2). These dates statistically overlap and, when averaged, give an age of 830±30 years BP (cal AD 1170 to 1270).

Since we did not recover this charcoal from a discrete feature it is not possible to definitively attribute the results of the radiocarbon dates to a specific event associated with the construction of Alligator Mound. However, as the charcoal was firmly embedded in sediment near the base of the mound, 107 cm below the surface, it likely derives from a fire that burned prior to, or coevally, with the construction of the mound. It may represent fragments of the trees burned in order to clear the land surface preparatory to laying out and building the mound, or it may be from a nearby hearth related to dedicatory ceremonies such as those that characterized contemporaneous effigy mounds in the upper Mississippi valley (Goldstein 1995, 106).

The soil humates sample was subjected to standard pretreatments including repeated acid washes to remove any rootlets or carbonates. The resulting date on the soil humates fraction was 1030±60 years BP (Beta-133667). The age of humates in the soil does not accurately reflect the age of any cultural event and, in the absence of contamination, the humates within the soil used to construct a mound could be expected to yield an age somewhat older than the actual date of mound construction. We therefore regard this date as generally corroborating a Late Prehistoric age for Alligator Mound, but the averaged age of 830±30 years BP obtained on wood charcoal samples provides a more accurate determination of its age.

Interpretations

> Archaeology is the only discipline that seeks to study human behavior and thought without having any direct contact with either (Trigger 1998, 1).

The demonstrably intact stratigraphy of the deposits above the charcoal samples and the absence of any plausible mechanism for introducing more recent charcoal into this context leads us to conclude that the radiocarbon dates of 820±40 years BP and 840±40 years BP accurately date the construction of the mound. In spite of the fact that the charcoal was not recovered in the context of a clearly-defined feature, it likely derives from burning activities associated with land-clearing activities preparatory to the con-

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Table 2. *Radiocarbon dates for Alligator Mound.*

14C date	Calibrated date	Laboratory no.	Material dated
300±60 BP	AD 1505–1595 AD 1620–1660	Beta-85517 (AMS)	particulate charcoal from flotation; wood (ring porous), <0.04 g
820±40 BP	AD 1195–1260	Beta-134236 (AMS)	wood charcoal (*Quercus* sp.), 0.14 g
840±40 BP	AD 1175–1250	Beta-134237 (AMS)	wood charcoal (ring porous, probably oak), 0.31 g
1030±60 BP	AD 980–1030	Beta-133667	soil humates

struction of the mound or to ceremonial fires related to the dedication of the effigy (e.g. Gartner 1999, 680). The date of 1030±60 BP obtained on a sediment sample collected from below a layer of flat sandstone cobbles corroborates the general age of the mound, but is not as accurate as the charcoal dates in determining the date of mound construction. Finally, the small fragments of charcoal yielding the date of 300±60 years BP were from a shallow deposit that was probably compromised by nineteenth-century cultivation and/or subsequent bioturbation. It may reflect on-going use of the effigy as a ritual site into the seventeenth century or it may relate to non-cultural or incidental burning. All of the dates collectively argue strongly in support of a Late Prehistoric age for Alligator Mound.

Given the relatively recent age of the effigy, it becomes more legitimate to attempt to interpret its iconography with reference to elements derived from Native American oral traditions recorded in the ethnographic and ethnohistoric literature (e.g. Hall 1997; cf. Mason 2000). Although such an approach has serious limitations, when used prudently it can offer useful insights (Trigger 1991; cf. Wood 2002).[2]

Alligator Mound as the Underwater Panther

The form of Alligator Mound is, or has been rendered by the plough, sufficiently generalized that it is probably impossible to know with certainty what animal its builders intended to represent. Plausible alternatives offered by various authors include a panther, an opossum, a salamander, or a squirrel. Hall (1993) identified similar mounds in Wisconsin and Iowa as water spirits. These differ somewhat, however, in that they usually are depicted in profile and their tails seldom curl. In considering which animal the Fort Ancient builders chose to monumentalize in such an imposing effigy, it can be assumed that they would not have selected a creature of little consequence. Indeed, the animal singled out for representation as an effigy mound is likely to have been one of fundamental importance in the culture of its builders.

Three animal spirits figure prominently in the cosmology of many Eastern Woodlands tribes: the Thunderbird of the Upperworld and the Horned Serpent and Underwater Panther of the Underworld (e.g. Barnouw 1977; Dewdney 1975; Grim 1983; Hamell 1998; Howard 1981; Landes 1968; Spindler & Spindler 1971; Vastokas & Vastokas 1973; Vecsey 1983). Ohio's Serpent Mound clearly represents a snake and the Alligator is similar to effigies in the upper Midwest that Hall (1993) and others have identified as water spirits or Underwater Panthers. Thus, Ohio's two monumental effigy mounds have plausible analogues in the two principal supernatural beings of the eastern Algonquian Underworld.[3]

Age of Underwater Panther motifs

The Underwater Panther is frequently depicted in the aboriginal art of eastern North America and the motif has ancient roots. Possible examples from Hopewell culture (*c.* 100 BC–AD 400) contexts include a horned monster carved in stone from Mound No. 4 at the Turner Group, an alligator-like monster effigy pipe from Esch Mound No. 1, and a supposed 'boulder mosaic' depicting a panther from Mound 25 at the Hopewell site. The 'boulder mosaic' is particularly interesting as a possible geoglyphic precursor to effigy mounds.

Moorehead's rough sketch of the alleged mosaic shows the creature in side-view with a long, curling tail (1897, 236). No other documentation of the effigy (including precise plans and photographs made of the mosaic) currently exists and, in subsequent excavations at Mound 25, Shetrone found no other similar features (1926, 97–8). The discovery of a stone mosaic depicting a bird (a vulture or, perhaps, a Thunderbird?) on the floor of the North Benton Mound (Magrath 1945, 42) establishes the fact that the Hopewell did indeed create 'boulder mosaics' and therefore supports the credibility of Moorehead's otherwise apocryphal report (see also Henriksen (1965) for a similar Hopewellian stone mosaic from a mound in the Illinois River valley).

The Underwater Panther appears to be the subject of several Late Woodland to Late Prehistoric effigy mounds in the upper Mississippi River valley (e.g. Birmingham & Eisenberg 2000; Hall 1993, 42–3;

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Radin 1923, 90, 96; Squier & Davis 1848, pl. XLIV, no. 7). Underwater Panthers also appear as a design impressed into the side of a rim of a castellated Late Woodland jar fragment from Illinois (Perino 1971), an incised design on the rim of a Late Woodland vessel from New Jersey (Blenk 1986), and as engravings on Late Woodland and Late Prehistoric pipe bowls from Wisconsin (Birmingham & Eisenberg 2000, 108; West 1905, 143) and Ohio (Abel 1984). Louis (2001) interprets a series of clay figurines, from the Johnson site in northern Michigan, as representations of the Underwater Panther. He attributes these to a Late Woodland component with an age of between AD 600 and the contact era (Louis 2001, 107). Similar figures appear carved onto several small, shale discs from a series of Late Woodland sites around Thunder Bay in northeastern Michigan. Cleland *et al*. (1984, 244) refer to these as 'the earliest documented occurrence' of this and other Algonquian symbols. The Underwater Panther frequently is depicted in petroglyphs (Fig. 8) and pictographs throughout midcontinental North America (e.g. Dewdney & Kidd 1962, 14; Diaz-Granados *et al*. 2001; Swauger 1984, 37, 57; Vastokas & Vastokas 1973, 96, 108). They are presumed to range in age from the Late Woodland through to the historic era (Swauger 1984, 269). Diaz-Granados suggested a range beginning no earlier than AD 980 'based on references to the Underwater Spirit in the ethnographic literature and its associated diagnostic motifs' and recently obtained an AMS radiocarbon date of AD 1000 for a pictograph of an antlered 'Underwater Spirit' (Diaz-Granados *et al*. 2001, 490).

The Underwater Panther was an important component of Mississippian iconography in the Midwest and Southeast and Howard states that its 'weather controlling attributes' as well as its 'medicine attributes may indicate an important fertility symbolism for these creatures in Mississippian ceremonialism' (1968, 54; see also Emerson 1989; O'Brien 1994). Historic Algonquian Indians in the Great Lakes region characterized the Underwater Panther as 'a spirit associated with lakes and rivers who was offered prayers and sacrifices for good fishing and safe water travel' (Brown & Brightman 1988, 109). In the Ojibwa Midewiwin, the Underwater Panther could be a patron and spirit-helper of human beings (Brown & Brightman 1988, 136).

Purpose of shrines to the Underwater Panther

> . . . there is an analogy in far northern Algonkian philosophy between symbol or picture and control-power, in bringing the objects portrayed under the dominance of the individual human spirit for the accomplishment of its needs (Speck 1977, 197).

> . . . the image of a manito, like the image of an animal or human, was an extension of the person . . . the Indians could influence the manitos by recreating their form (Vecsey 1983, 109–10).

In 1723 the Jesuit priest Rasles wrote that the Alongquian Indians would offer '*Michibichi*' (the Underwater Panther) a sacrifice

> when they go to fish, or undertake a voyage. This sacrifice consists of throwing into the water tobacco, provisions, and kettles; and in asking him that the water of the river may flow more slowly, that the rocks may not break their canoes, and that he will grant them an abundant catch (Thwaites 1900, 159).

McKenney (1972, 330) reported the existence of a shrine to the Underwater Panther on North Point in Thunder Bay in Lake Huron. This shrine consisted of a cluster of 'about twenty stones, four of which are larger than the rest'. McKenney's Native American informants identified these four boulders as 'the manito' and indicated the other stones had been added to the shrine at various times. McKenney (1972, 330) reported that the Indians left offerings at the shrine 'to secure the pleasure of this god, and to obtain from him the favor of a fair wind, and protection in making the traverse of Thunder bay'. The offerings consisted of 'tobacco, bits of iron, pieces of old kettles, pipes, and various other things'.

Morrisseau, whose maternal grandfather was a Mide shaman, reported that the 'Ojibway Indians of Lake Nipigon had an offering rock erected' to Misshipeshu. 'Offerings of copper pails were thrown into the water and black dogs as well as white dogs, decorated in the very best, were offered alive to the water god for it to eat' (Morriseau 1965, 27).

Clarke reported that a group of Wyandots at a 'boggy spot' near the mouth of the Huron River in Michigan had an 'altar' to a 'mysterious spirit' that manifested itself as a 'white panther' emerging from a 'sulphureous spring' (1870, 153–8). At this altar, the Wyandots made

> burnt offerings and signified their sincere devotion, by casting valuable articles into the spring, which consisted of various kinds of ornamented silver works, . . . wampum belts, beads, and other articles . . . as sacrifice offerings to the strange god (1870, 154).

In return, the spirit allowed them to take some of its blood. With this congealed blood the suppliant

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> . . . could obtain anything he may wish for that he could not acquire before; good luck always attended him on his hunting grounds; good luck attended his wife when making maple sugar; good luck attended him whilst on the war path, and he was always successful whenever he used the substance, either for good to himself, or for evil purposes to others. (Clarke 1870, 156)

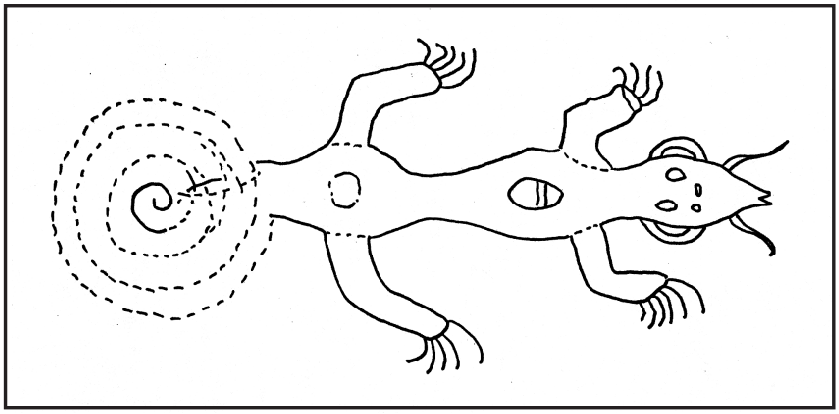

Figure 8. *Rendering of a petroglyph depicting an Underwater Panther from along the Ohio River near Buffington Island in West Virginia. The concentric circles around the curling tail evoke the deadly whirlpools the Underwater Panther whipped up to sink canoes and drown the unwary or impious. It also suggests a 'downward-funneling passage into the underworld' (Phillips 1984, 49) such as are depicted in some Native American decorated pouches of the historic era. Compare this representation with the plan of Alligator Mound (Fig. 2). A note on the original indicates this petroglyph was ten feet (3 m) long. (Copied from a drawing in the Wills De Haas papers, 1881, National Anthropological Archives, Smithsonian Institution.)*

None of these ethnohistoric accounts refer specifically to the construction and use of an effigy mound as a shrine for the presentation of offerings to secure spiritual power or 'luck'. Nevertheless, the iconographic similarities between Alligator Mound and images of the Underwater Panther (compare, for example, Fig. 2 with Fig. 8), and the structural similarities between the stone altars associated with the Alligator and Serpent mounds and the offering rocks or altars described in various ethnohistoric accounts, permit the inference that Alligator Mound was a shrine dedicated to the Underwater Panther. By creating this massive sculptural image of the manitou, the people would have been creating a powerful linkage with the Underworld and its potent energies. The stone platform with its evidence of repeated episodes of burning is plausibly interpreted as a sacrificial altar whereon 'burnt offerings', of the sort delivered up to the Underwater Panther by the Wyandots along Lake Erie, were made to this earlier incarnation of that Underworld Spirit.

Effigy mounds and the Fort Ancient culture

If Alligator Mound was a shrine dedicated to the Underwater Panther, then the approximately contemporary Serpent Mound likely served a similar function. Tarlton Cross Mound (Squier & Davis 1848, 98), an undated emblematic mound, may also be understood in this context. Although not a zoomorphic effigy, Tarlton Cross mound appears nonetheless to be connected with the Serpent and the Alligator and may date to the same period. Phillips contends that the 'equal-armed cross . . . (as) employed by Great Lakes Indian artists' symbolizes the four cardinal directions and the 'central axis of the cosmos' (1984, 27). 'Along this central axis lay the openings into the sky world and the underworld which permitted contact with the manitos dwelling above and below' (Phillips 1984, 27). Moreover, the cross frequently is associated with the Underwater Panther in Mississippian iconography (e.g. Howard 1968, 55). Tarlton Cross is located on a 'narrow spur of land' compared by Squier & Davis to the situation of Serpent Mound (1848, 98) and it is immediately adjacent to a 'circular elevation of stone and earth, resembling that in connection with' Alligator Mound (Squier & Davis 1848, 98).

The fact that there are so few effigies documented in Ohio limits our ability to make meaningful generalizations about their forms and distribution such as have been offered for the effigy mounds of Wisconsin and Iowa (e.g. Birmingham & Eisenberg 2000; Gartner 1999; Goldstein 1995). Their rarity in this region indicates they could not have served the same territorial and integrative functions suggested for the multitudinous effigies in the upper Midwest (e.g. Mallam 1976). But if these structures were shamanic in conception and use, they also were corporate in execution. They were not built by individuals on a vision quest — though, once built, they could have been used by individuals for private rituals. Their monumentality indicates that a social group cooperated in their design and construction. This

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proposed union of shamanic purpose and corporate effort would be remarkable in the recent past, for shamans ordinarily derive 'political-religious force not from working in concert with similar religious types but in an individual capacity' (Grim 1983, 189). Perhaps, as others have proposed, something like the Midewiwin Grand Medicine Society existed during the Late Prehistoric era (Birmingham & Eisenberg 2000, 134; cf. Hickerson 1962) and then, as in the historic period, the Underworld manitous were the most powerful patrons of the shamans.

Spindler & Spindler have argued that the belief in shamanic power and the creation of institutions such as the Midewiwin serve to insure social cooperation and preserve

> the status quo of the group by vesting the elders with special powers. In the absence of direct social controls exercised through positions of secular power, witchcraft and the threat of witchcraft serve as means of controlling or preventing behavior that is potentially disruptive in interpersonal relations (1971, 78).

The radiocarbon dates obtained for Alligator Mound indicate it was built during the transition from the Early Fort Ancient period (AD 1000–1200) to the Middle Fort Ancient period (AD 1200–1400). This transition was marked by the sudden appearance of nucleated villages with increasing evidence for social inequality (Pollack & Henderson 2000, 201; see also Carskadden & Morton 2000, 164). The appearance of the Ohio Serpent and Alligator mounds during this pivotal period, coupled with the fact that only two zoomorphic geoglyphs of this scale were ever built in this region, in contrast to the upper Mississippi valley where thousands were built, suggests the need for a more nuanced interpretation. The construction of effigy/shrines such as Alligator Mound, Serpent Mound, and the smaller-scale geoglyphs such as the Kern effigies, the undated Stone Serpent Mound of Kentucky and other putative stone serpent effigies discussed by Sanders (1991, 276–7), may represent attempts, by local Fort Ancient populations, to deal with the increasingly complex social problems created by a growing population without recourse to the concentration of political power in an élite as was then occurring in the Mississippi valley. The effigy mounds, in their construction and use as shrines to the lords of the Underworld, would have been powerful unifying symbols for communities and regions. They also would have served as vivid reminders of the power of the shamans or priests to invoke the aid of, and secure protection from, these awesome supernatural beings. The Ohio Serpent and Alligator therefore would have constituted new 'mechanisms of sanctification' (Drennan 1976, 359) introduced to legitimize the authority of the shamans/priests to negotiate the transition from a relatively fluid society based on hunting, gathering, and gardening to one more circumscribed and based on sedentary farming. But such a 'system of rituals is very "expensive" . . . (consuming) a considerable amount of goods and labor' (Drennan [quoting Rappaport] 1976, 360). The ultimate failure of these attempts is suggested by the fact that only two large-scale earthen effigy mounds were built in the Ohio valley. Either the labour investments could not be sustained (for whatever reason) or a new, more secularly-based political authority emerged and the effigies became magnificent fossils of the *ancien régime*. Under this scenario, Alligator Mound would represent the last gasp of a monumental mound-building tradition that reached its apogee in the same valley, but a thousand years earlier (Fig. 1).

Conclusions

It long has been understood that the archaeological landscape is a palimpsest. Artefacts, features and structures that today are spatially associated were not necessarily coeval. And yet, many archaeologists have assumed that Alligator Mound is a Hopewell construction merely because of its spatial proximity to the Newark Earthworks.

Radiocarbon dates obtained on charcoal and soil humates now offer compelling evidence that the Alligator is a Late Prehistoric effigy mound. The charcoal samples that yielded the radiocarbon dates of 820±40 and 840±40 years BP were not from a discrete feature; however, they were firmly embedded in sediment at the base of the mound beneath one metre of undisturbed mound fill. An analysis of the overlying soils confirms that there has been no recent disruption of the (sub-ploughzone) soil column overlying the dated samples. These radiocarbon dates therefore provide an accurate estimate of the date of construction of the mound; or, more precisely, the date of land-clearing activities or incendiary ceremonies that immediately preceded, or were contemporary with, the construction of the mound. The radiocarbon date of 1030±60 years BP on soil humates from Stratum III is corroborative of the relatively late age for Alligator Mound, while the radiocarbon date of 300±60 years BP likely reflects either the introduction of more recent charcoal into a disturbed portion of the mound, or continuing use of the site into the seventeenth century AD.

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The results of our excavations suggest the following construction sequence for Alligator Mound. The Late Prehistoric builders carefully selected the location for the mound based, in part, on the vista provided by this prominent spur. They cleared the vegetation from the crest of the spur and stripped the silt loam topsoil (A and E horizons). Mound construction began with the erection of a number of small piles of flaggy sandstone cobbles, derived from local bedrock, forming the framework for the effigy. These stone piles were then covered with a thick mantle of nonstratified, predominantly silt loam fill derived from the topsoil that had been stripped from the spur crest. Finally, the flanks of the mound, at least, were covered with a facing of flat sandstone cobbles, either for aesthetic reasons or to help stabilize the sides of the effigy.

Effigy mounds are exceedingly rare or nonexistent in eastern North America prior to about AD 700 when they became common in the upper Mississippi valley. Hall interprets the iconography of the effigies as 'monumental expressions of the cosmology of their builders' (Hall 1993, 51). He identified one class of effigy with long tails as water spirits, or Underwater Panthers. Alligator Mound shares elements of this iconography and, from the results of the radiocarbon dates reported herein, dates to the same general period. Serpent Mound, Ohio's only other monumental effigy mound, has yielded radiocarbon dates broadly concurrent with those obtained from Alligator Mound (Fletcher *et al*. 1996). And the Serpent and the Underwater Panther are closely associated in the religious iconography of many Eastern Woodlands groups as the ruling manitous of the Underworld. The Underwater Panther motif does not become prominent in the art of much of eastern North America until about AD 980 (Diaz-Granados *et al*. 2001, 490). Drooker (1997, 326) has noted the remarkable similarity between the Alligator Mound and small ceramic zoomorphs applied to Late Prehistoric pottery vessels. Moreover, Drooker also suggested that the curvilinear guilloche motif incised into many Fort Ancient vessels might represent stylized intertwining serpents (1997, 326) reinforcing the connection between ceramic vessels that hold water and decorative motifs evocative of the watery Underworld.

For these reasons, we conclude that Alligator Mound is a Late Prehistoric effigy mound representing the Underwater Panther. We suggest that the effigy functioned predominantly as a shamanic portal through which offerings could be conveyed to the powers of the Underworld. Such offerings were intended to secure the benevolence, or at least the 'benign neglect' (Vecsey 1983, 75), of the Underworld beings or to siphon power from the Underworld to serve a variety of purposes. Serpent Mound, the Kern effigies, and perhaps Tarlton Cross mound likely served similar functions for contemporary groups in southern Ohio.

The recovery of mica from the backdirt of a woodchuck burrow at Alligator Mound is not inconsistent with this interpretation, nor would its presence within the effigy necessarily indicate a Middle Woodland attribution. Mica continued to be used in ritual contexts throughout, at least, the Late Woodland period (Seeman & Dancey 2000, 599), and apparently was identified with the spiritually-charged scales of the Underwater Panther and Serpent by the historic Huron-Wyandot and Seneca tribes (Hamell 1998, 271).

The fact that effigy mounds are so rare in the Ohio valley makes it difficult to derive meaningful generalizations about their forms and distribution. This problem is exacerbated by the general lack of archaeological research at these sites. We recognize the difficulty and present our interpretations as tentative explanations for the temporal context, iconography, function, as well as the rarity of effigy mounds in Ohio. Future work at Tarlton Cross Mound and the undated stone serpent effigies in Kentucky, as well as further research at the Alligator and Serpent Mounds, undoubtedly will result in the refinement of many of our conclusions.

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Notes

1. Given the variability of soil-forming factors such as local topography, initial parent material, local drainage conditions, and other variables, the quantity of clay translocation and clay bulge development cannot provide more than a qualitative estimate of soil profile age.
2. Oral traditions relating to the Underwater Panther are documented from a wide variety of Native American groups. We do not intend our use of these data to imply any direct cultural connections between particular historic groups and the prehistoric builders of Alligator Mound.
3. The name historically associated with 'Alligator' mound may contain a clue to the identification of the creature represented by the effigy. Few people who have viewed the mound and who possessed even a passing familiarity with the appearance of alligators have been persuaded that the mound was ever intended to represent an alligator. The effigy mound's relatively small, round head and the curling tail practically preclude such an identification. However, if early European American settlers had asked locally resident Native Americans what the mound was intended to represent, and if they had indicated the effigy represented the Underwater Panther, how might the European Americans have interpreted the bizarre notion of a panther that lives underwater? George Nelson, an early fur trader who worked among the Canadian Cree and Ojibwa and who took a remarkably sympathetic interest in their religious beliefs, found the Native American term for this manitou more than a little obscure: Nelson variously translated *Michi-Pichoux* as 'Water Lynx', 'Tyger', 'water-Cat', and 'water-dog', 'prefiguring difficulties experienced by many others in rendering the name and the concept intelligible in English' (Brown & Brightman 1988, 108–9). When the salient attributes of the Underwater Panther were described to a European American, that is, a monster with big teeth and a long tail who lives in the water and occasionally eats people, might not these characteristics have suggested an alligator? And subsequent residents of the area would have been assured of the correctness of this identification because, regardless of how imperfectly the mound resembled an alligator, the descendants of the people who created the effigy said, or had been interpreted to have said, that this was what it represented. This entirely speculative scenario offers one possible explanation for why such a manifestly inappropriate name has clung so tenaciously to this effigy. In this context, it is interesting to note that some Maliseet-Passamaquoddy in northeastern North America now identify a traditional underwater spirit-creature with the alligator (Erikson 1978, 133).

References

Abel, T., 1984. An engraved vasiform pipe from Pearson Village. *Ohio Archaeologist* 34(2), 45.

Barnouw, V., 1977. *Wisconsin Chippewa Myths & Tales*. Madison (WI): University of Wisconsin Press.

Bernhardt, J.E., 1976. A preliminary survey of Middle Woodland prehistory in Licking County, Ohio. *Pennsylvania Archaeologist* 46, 39–54.

Bettis, E.A., III, 1988. Pedogenesis in Late Prehistoric Indian mounds, Upper Mississippi valley. *Physical Geography* 9, 263–79.

Bickham, W.D., 1860. Ancient monuments in Ohio — further developments among the mounds — the Holy Stones again. *Cincinnati Daily Commercial* 21(118), 21 July 1860.

Birmingham, R.A. & L.E. Eisenberg, 2000. *Indian Mounds of Wisconsin*. Madison (WI): University of Wisconsin Press.

Blenk, M.H., 1986. An unusual animal effigy on pottery. *Bulletin of the Archaeological Society of New Jersey* 40, 26–7.

Bork, K.B. & R.J. Malcuit, 1979. Paleoenvironments of the Cuyahoga and Logan formations (Mississippian) of central Ohio. *Geological Society of America Bulletin* 90, 1782–838.

Brinton, D.G., 1885. The so-called 'Alligator Mound'.

Hoosier Mineralogist and Archaeologist 1(7), 1–2.
Brockman, C.S., 1998. *Physiographic Regions of Ohio*. Ohio Division of Geological Survey, map with text.
Brown, J.S.H. & R. Brightman, 1988. *'The Orders of the Dreamed': George Nelson on Cree and Northern Ojibwa Religion and Myth, 1823*. St Paul (MN): Minnesota Historical Society Press.
Carskadden, J. & J. Morton, 2000. Fort Ancient in the central Muskingum valley of eastern Ohio: a view from the Philo II site, in Genheimer (ed.), 158–93.
Clarke, P.D., 1870. *Origin and Traditional History of the Wyandots*. Toronto: Hunter, Rose & Co.
Cleland, C.E., R.D. Clute & R.E. Haltiner, 1984. *Naub-cow-zo-win* discs from northern Michigan. *Midcontinental Journal of Archaeology* 9(2), 235–49.
Cremeens, D.L., 1995. Pedogenesis of Cotiga Mound, a 2100–year old Woodland mound in southwest West Virginia. *Soil Science Society of America Journal* 59, 1377–88.
Dewdney, S., 1975. *The Sacred Scrolls of the Southern Ojibway*. Toronto: University of Toronto Press.
Dewdney, S. & K.E. Kidd, 1962. *Indian Rock Paintings of the Great Lakes*. Toronto: University of Toronto Press.
Diaz-Granados, C., M.W. Rowe, M. Hyman, J.R. Duncan & J.R. Southon, 2001. AMS radiocarbon dates for charcoal from three Missouri pictographs and their associated iconography. *American Antiquity* 66, 481–92.
Drennan, R.D., 1976. Religion and social evolution in Formative Mesoamerica, in *The Early Mesoamerican Village*, ed. K.V. Flannery. Orlando (FL): Academic Press, 345–68.
Drooker, P.B., 1997. *The View from Madisonville: Protohistoric Western Fort Ancient Interaction Patterns*. (Memoirs of the Museum of Anthropology 31.) Ann Arbor (MI): University of Michigan.
Emerson, T.E., 1989. Water, serpents, and the Underworld: an exploration into Cahokian symbolism, in *The Southeastern Ceremonial Complex: Artifacts and Analysis: the Cottonlandia Conference*, ed. P. Galloway. Lincoln (NE): University of Nebraska Press, 45–92.
Erikson, V.O., 1978. Maliseet-Passamaquoddy, in *Handbook of North American Indians*, vol. 15: *Northeast*, ed. B.G. Trigger. Washington (DC): Smithsonian Institution, 123–36.
Fletcher, R.V., T.L. Cameron, B.T. Lepper, D.A. Wymer & W. Pickard, 1996. Serpent Mound: a Fort Ancient icon? *Midcontinental Journal of Archaeology* 21(1), 105–43.
Forsyth, J.L., 1966. Glacial map of Licking County. *Ohio Division of Geological Survey, Report of Investigation* No. 59, map with text.
Frolking, T.A. & B.T. Lepper, 2001. Geomorphic and pedogenic evidence for bioturbation of artifacts at a multicomponent site in Licking County, Ohio, USA. *Geoarchaeology* 16, 243–63.
Frolking, T.A. & J.P. Szabo, 1998. *Quaternary Geology along the Eastern Margin of the Scioto Lobe in Central Ohio*. (Guidebook 16.) Columbus (OH): Department of Natural Resources, Division of Geological Survey.
Gartner, W.G., 1999. Late woodland landscapes of Wisconsin: ridged fields, effigy mounds and territoriality. *Antiquity* 73, 671–83.
Gee, G.W. & J.W. Bauder, 1986. Particle-size analysis, in *Methods of Soil Analysis*, part 1: *Physical and Mineralogical Methods*, ed. A. Klute. 2nd edition. (Agronomy Monograph 9.) Madison (WI): American Society of Agronomy.
Genheimer, R.A. (ed.), 2000. *Cultures Before Contact: the Late Prehistory of Ohio and Surrounding Regions*. Columbus (OH): Ohio Archaeological Council.
Glotzhober, R.C. & B.T. Lepper, 1994. *Serpent Mound: Ohio's Enigmatic Effigy Mound*. Columbus (OH): Ohio Historical Society.
Goldstein, L., 1995. Landscapes and mortuary practices: a case for regional perspectives, in *Regional Approaches to Mortuary Analysis*, ed. L.A. Beck. New York (NY): Plenum Press, 101–21.
Gordon, R.B., 1969. *The Natural Vegetation of Ohio in Pioneer Days*. (Bulletin of the Ohio Biological Survey N.S. 3(2).) Columbus (OH): Ohio State University.
Grim, J.A., 1983. *The Shaman: Patterns of Religious Healing among the Ojibway Indians*. Norman (OK): University of Oklahoma Press.
Hall, R.L., 1993. Red banks, Oneota, and the Winnebago: views from a distant rock. *Wisconsin Archeologist* 74, 10–79.
Hall, R.L., 1997. *An Archaeology of the Soul: North American Indian Belief and Ritual*. Urbana (IL): University of Illinois Press.
Hamell, G.R., 1998. Long-tail: the panther in Huron-Wyandot and Seneca myth, ritual, and material culture, in *Icons of Power: Feline Symbolism in the Americas*, ed. N.J. Saunders. London: Routledge, 258–91.
Henriksen, H.C., 1965. Utica Hopewell, a study of early Hopewellian occupation in the Illinois River valley, in *Middle Woodland Sites in Illinois*. (Illinois Archaeological Survey, Bulletin 5.) Urbana (IL): University of Illinois, 1–67.
Hickerson, H., 1962. Notes on the postcontact origin of the Midewiwin. *Ethnohistory* 9, 404–23.
Hoffman, W.J., 1891. *The Midewiwin or 'Grand Medicine Society' of the Ojibwa.* (Seventh Annual Report of the Bureau of Ethnology, 1885–86.) Washington (DC).
Holmes, W.H., 1886. A sketch of the Great Serpent Mound. *Science* 8(204), 624–8.
Hooge, P.E., 1992. Alligator Mound: a case study of archaeology and preservation in Licking County, in *Vanishing Heritage: Notes and Queries about the Archaeology and Culture History of Licking County, Ohio*, eds. P.E. Hooge & B.T. Lepper. Newark (OH): Licking County Archaeology and Landmarks Society, 65–73.
Hooge, P.E., 1993. Preserving the Ancient Past in Licking County, Ohio: a Case Study. Unpublished PhD dissertation, Ohio State University, Columbus.

Howard, J.H., 1968. *The Southeastern Ceremonial Complex and its Interpretation*. (Memoir 6.) Columbia (MO): Missouri Archaeological Society.

Howard, J.H., 1981. *Shawnee! The Ceremonialism of a Native American Tribe and its Cultural Background*. Athens (OH): Ohio University Press.

Landes, R., 1968. *Ojibwa Religion and the Midewiwin*. Madison (WI): University of Wisconsin Press.

Lewis, T.H., 1886. The 'monumental tortoise' mounds of 'De-Coo-Dah.' *American Journal of Archaeology & the History of the Fine Arts* 2, 65–9.

Louis, W.A., 2001. Clay effigy representations of the bear and *Mishipishu*: Algonquin iconography from the Late Woodland Johnson site, northern lower Michigan. *Midcontinental Journal of Archaeology* 26, 105–19.

McKenney, T.L., 1972. *Sketches of a Tour to the Lakes*. Barre (MA): Imprint Society.

Magrath, W.H., 1945. The North Benton Mound: a Hopewell site in Ohio. *American Antiquity* 11, 40–46.

Mallam, R.C., 1976. *The Iowa Effigy Mound Manifestation: an Interpretive Model*. (Office of the State Archaeologist, Report 9.) Iowa City (IO): University of Iowa.

Mason, R.J., 2000. Archaeology and Native American oral tradition. *American Antiquity* 65, 239–66.

Moorehead, W.K., 1885. Alligator Mound. *Hoosier Mineralogist and Archaeologist* 1(6), 1–2.

Moorehead, W.K., 1897. The Hopewell group. *The Antiquarian* 1, 113–20, 153–8, 178–84, 208–14, 236–44, 254–64, 291–5, 312–16.

Morriseau, N., 1965. *Legends of my People the Great Ojibway*. Toronto: Ryerson Press.

Murtagh, W.J., 1976. *The National Register of Historic Places*. Washington (DC): US Department of the Interior, National Park Service.

O'Brien, M.J., 1994. *Cat Monsters and Head Pots: the Archaeology of Missouri's Pemiscot Bayou*. Columbia (MO): University of Missouri Press.

Pacheco, P.J., 1996. Ohio Hopewell regional settlement patterns, in *A View from the Core: a Synthesis of Ohio Hopewell Archaeology*, ed. P.J. Pacheco. Columbus (OH): Ohio Archaeological Council, 16–35.

Parkinson, R., M.L. Wigginton & P.C. Jenny, 1992. *Soil Survey of Licking County, Ohio*. Washington (DC): Division of Soil and Water Conservation in cooperation with Ohio Department of Natural Resources.

Parsons, R.B., W.H. Scholtes & F.F. Riecken, 1962. Soils of Indian mounds in northeastern Iowa as benchmarks for studies of soil genesis. *Soil Science Society of America Proceedings* 26, 491–6.

Pavey, R.R., R.P. Goldthwait, C.S. Brockman, D.N. Hull, E.M. Swinford & R.G. Van Horn, 1999. *Quaternary Geology of Ohio*. Ohio Division of Geological Survey. Map No. 2.

Perino, G., 1971. How early is the Underground Panther design element? *Central States Archaeological Journal* 18(1), 4–7.

Phillips, R.B., 1984. *Patterns of Power: the Jasper Grant Collection and Great Lakes Indian Art of the Early Nineteenth Century*. McMichael Canadian collection, Ontario: Kleinburg.

Pidgeon, W., 1858. *Traditions of De-Coo-Dah and Antiquarian Researches*. New York (NY): Horace Thayer.

Pollack, D. & A.G. Henderson, 2000. Insights into Fort Ancient culture change: a view from south of the Ohio River, in Genheimer (ed.), 194–227.

Porter, D.R., 1971. *National Register of Historic Places Inventory – Nomination Form*. Columbus (OH): Ohio Historic Preservation Office (Copy on file.)

Radin, P., 1923. The Winnebago tribe, in *37th Annual Report of the Bureau of American Ethnology, 1915–1916*. Washington (DC): Government Printing Office, 35–560.

Salisbury, J.H. & C.B. Salisbury, 1862. Accurate Surveys & Descriptions of the Ancient Earthworks at Newark, Ohio. Unpublished manuscript, American Antiquarian Society, Worcester (MA).

Salzer, R.J., 1993. Oral literature and archaeology. *Wisconsin Archeologist* 74(1–4), 80–119.

Sanders, S.L., 1991. The Stone Serpent Mound of Boyd County, Kentucky: an investigation of a stone effigy structure. *Midcontinental Journal of Archaeology* 16, 272–84.

Seeman, M.F. & W.S. Dancey, 2000. The Late Woodland period in southern Ohio: basic issues and prospects, in *Late Woodland Societies: Tradition and Transformation across the Midcontinent*, eds. T.E. Emerson, D.L. McElrath & A.C. Fortier. Lincoln (NE): University of Nebraska Press, 583–611.

Shetrone, H.C., 1926. Explorations of the Hopewell group of prehistoric earthworks. *Ohio Archaeological and Historical Publications* 35, iii–227.

Soil Survey Staff, 1975. *Soil Taxonomy*. (Handbook 436.) Washington (DC): US Department of Agriculture.

Soil Survey Staff, 1988. *Keys to Soil Taxonomy*. (SMSS Technical Monograph #6, Fourth Printing.) Ithaca (NY): Cornell University.

Speck, F.G., 1977. *Naskapi: the Savage Hunters of the Labrador Peninsula*. Norman (OK): University of Oklahoma Press.

Spindler, R. & L. Spindler, 1971. *Dreamers Without Power: the Menomini Indians*. New York (NY): Holt, Rinehart and Winston, Inc.

Squier, E.G. & E.H. Davis, 1848. *Ancient Monuments of the Mississippi Valley*. (Smithsonian Institution, Contributions to Knowledge 1.) Washington (DC): Smithsonian Institution Press.

Stallings, R., 1981. The Alligator effigy mound. *Ohio Archaeologist* 31(1), 13–15.

Swauger, J.L., 1984. *Petroglyphs of Ohio*. Kent (OH): Kent State University Press.

Thwaites, R.G. (ed.), 1900. *The Jesuit Relations and Allied Documents*, vol. 67. Cleveland (OH): Burrows Brothers.

Trigger, B.G., 1991. Distinguished lecture in archeology: constraint and freedom: a new synthesis for archeological explanation. *American Anthropologist* 93, 551–69.

Trigger, B.G., 1998. Archaeology and epistemology:

dialoguing across the Darwinian chasm. *American Journal of Archaeology* 102, 1–34.
Vastokas, J.M. & R.K. Vastokas, 1973. *Sacred Art of the Algonkians: a Study of the Peterborough Petroglyphs*. Peterborough, Ontario: Mansard Press.
Vecsey, C., 1983. *Traditional Ojibwa Religion and its Historical Changes*. (American Philosophical Society, Memoir 152.) Philadelphia (PA): American Philosophical Society.
West, G.A., 1905. Aboriginal pipes of Wisconsin. *Wisconsin Archeologist* 4(3–4), 47–171.
White, J.R., 1986. The Kern effigy: evidence for a prehistoric Fort Ancient summer solstice marker. *North American Archaeologist* 7(2), 137–65.
White, J.R., 1987. Kern effigy #2: a Fort Ancient winter solstice marker? *Midcontinental Journal of Archaeology* 12(2), 233–42.
White, J.R., 1996. The Stubbs earthwork: serpent effigy or simple embankment. *North American Archaeologist* 17(3), 203–37.
Whittlesey, C., 1852. *Descriptions of Ancient Works in Ohio*. (Smithsonian Contributions to Knowledge 3[7].) Washington (DC): Smithsonian Institution Press.
Williams, S., 1991. *Fantastic Archaeology: the Wild Side of North American Prehistory*. Philadelphia (PA): University of Pennsylvania Press.
Wood, W.R., 2002. The realities of ethnogenesis. *Missouri Archaeologist* 63, 71–82.
Wright, G.F., 1888. Report on the present condition of mounds and earthworks of Ohio. *Ohio Archaeological and Historical Quarterly* 1, 333–9.

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