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# MANA from heaven: Testing the utility of minimum analytical nodule analysis at large, repeatedly reoccupied ceremonial sites

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ABSTRACT

Minimum Analytical Nodule Analysis (MANA) continues to gain popularity among lithic analysts as a compliment to refitting. Despite the increased use of MANA in the last two decades, all implementations focus on the same types of sites, those occupied by hunter-gatherers and our foraging ancestors. This paper represents the first formal attempt to explore the utility of MANA among groups with different levels of mobility and social organization. This is accomplished by examining the bladelet industry utilized by horticultural groups at two ceremonially oriented Hopewell earthworks. This attempt to expand the scope of MANA can be labeled as a success which yielded information on bladelet production and discard processes, as well as an additional line of evidence on temporal relationships at the sites. Issues were encountered, however, in data integration common when multiple archaeologists lead independent investigations at large sites. Additional issues arose with relatively few artifacts assigned to individual nodules and the subsequent difficulties in examining production skill and exchange. But even these issues point to new possibilities for research elsewhere to address new types of questions.



## 1. Introduction

Archaeologists have long attempted to piece broken artifacts back together, if only to make them presentable for museum display. With the rise of scientific archaeology in the mid-20th century refitting studies began to take a greater role in hypothesis testing, especially in identifying production sequence and site formation processes (Cahen et al. 1979). Lithic refitting can be a powerful analytical tool but it does have drawbacks and limitations. An often cited reason for not undertaking lithic refitting is the time involved, which has exceeded several thousand person hours in some studies (Laughlin and Kelly 2010). Another limitation is that if some pieces are missing it will be impossible to refit artifacts that clearly come from the same tool or core. In response to the difficulties, several scholars (e.g., Larson and Ingbar 1992; Larson and Kornfeld 1997) formalized a complimentary approach known as Minimum Analytical Nodule Analysis (hereafter MANA). The goal of MANA is to identify groups of lithic artifacts that all derive from the same core or nodule, known as the Minimum Analytical Nodule (hereafter MAN). Larson and Kornfeld (1997:4) operationalize a MAN as "pieces in a nodule [that] share a specific constellation of features that differentiate these pieces from others of the same raw material type". As such, individual MAN is all of the artifacts that were removed from an individual stone nodule or core. MAN is defined on the basis of similarities in "color, texture, inclusions, luster, etc." (Larson and Ingbar 1992:153). While they are distinct methods, MANA nearly always includes a refitting component as well.

Despite the ubiquity of chipped stone artifacts at sites across the globe, thus far, all implementations of MANA have focused on sites associated with anatomically modern hunter-gatherers or earlier foraging hominids (Bruce 2001; Byrnes 2009; Cooper and Meltzer 2009; Hurst et al. 2010; Johnson et al. 2008; Knell 2009, 2012; Kornfeld et al. 2007; Larson and Ingbar 1992; Larson and Kornfeld 1997; Scerri et al. 2015; Stout et al. 2010; Turq et al. 2013; White 2012; Yoshikawa 2010; see also Frison 1974; Kelly 1985 for similar approaches not formally expressed as MANA). These sites tend to be camps or logistical sites occupied by relatively small groups for relatively short periods of time. But all of this work on small sites associated with foragers begs some very important questions. Can MANA be applied to sites occupied by people with other subsistence strategies, political organization, or levels of mobility? What can MANA reveal about ritual or ceremonial aspects of prehistoric groups? I address these questions here through a case study employing refitting and MANA at two Hopewell earthworks (Fort Ancient and Stubbs) in southwest Ohio. The analysis identifies some important insights gained, as well as obstacles to implementing MANA at these types of sites.

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### 1.1. Ohio Hopewell

From 2000 to 1500 years ago, Hopewell earthworks were constructed along the major tributaries of the Central Ohio River Valley and utilized by horticultural groups participating in the Hopewell Interaction Sphere (Caldwell 1964). Those participating in the Hopewell Interaction Sphere brought socially valued goods from raw material sources across North America to the Central Ohio River Valley for use in mortuary ritual and social ceremony (Abrams 2009). The earthworks were generally separate from habitation sites with the latter appearing as small hamlets dispersed around the earthworks (Dancey and Pacheco 1997; Pacheco and Dancey 2006, but see Yerkes 2002, 2006). Associated groups gathered at each earthwork for relatively short periods to participate in monumental construction, mortuary activity, exchange, caching of socially valued goods, craft production, and feasting (Abrams 2009). Evidence for the recurrence of these activities over several centuries is present in and around many earthworks, including the two examined here (Lepper and Connolly 2004; Miller 2015). Hopewell social organization can best be categorized as tribal with tribal interaction and integration occurring during gatherings at earthworks (Abrams 2009; Yerkes 2002).

The Hopewell chipped stone toolkit contained a variety of unifacially and bifacially retouched tools in addition to a distinctive core-and-blade industry (Montet-White 1968; Pi-Sunyer 1965). As part of a larger project investigating function of bladelets (Miller 2010, 2014a, 2014b, 2015), the analysis here focuses on this tool type. Hopewell bladelets have a length to width ratio of at least two to one, roughly parallel margins, and a triangular, trapezoidal, or prismoidal cross section (Greber et al., 1981; Miller 2014a, 2015; Nolan et al., 2007; Pi-Sunyer, 1965:61). All byproducts of the bladelet production process including bladelets, bladelet cores, rejuvenation flakes, and bladelet trimming flakes were included in the study. Trimming flakes result from preparing the core for bladelet production and include Lame à crête or crested blades as well as platform preparation flakes. Rejuvenation flakes are the result of major removals from the bladelet core in order to restore a desirable platform angle (Miller 2015:Fig. 2). As rejuvenation and trimming flakes constitute a small proportion of the assemblage (3.93% (Miller 2014b:164)), I largely lump these categories under the general term bladelet in the following discussion, only differentiating between bladelets and bladelet cores when necessary.

Bladelets represent the most numerous tool type recovered from contexts in and around the Fort Ancient and Stubbs earthworks (Miller 2014a, 2014b, 2015). Between 79.4% and 92.5% of the tools (i.e., non-debitage or cores) recovered in excavated or surface collected areas of Fort Ancient are bladelets (Connolly 1991:Table 2; Lazazzera 2009:Table 5.8; Miller 2014a:88; Vickery and Sunderhaus 2004:Table 12.9). In and around the Stubbs earthworks, bladelets constitute between 72.5% and 96.0% of the tool assemblages found in surface collections (Genheimer 1996:Table 6.4).

A few scholars have assigned Hopewell bladelets to specific flint nodules in the past, although it was without explicit reference to MANA. For example, Blosser (1989:112–113) recognized nine “core groups” among the bladelets from Jennison Guard along the Ohio River in southern Indiana. Seeman (1996:307) identified 13 bladelets from a single core at the Yant Mound in Stark County, Ohio. Connolly (2004a:41) identified “several flint bladelets made from a single core” associated with a stone pavement in Gateway 84 at the Fort Ancient earthwork. Of the above examples, only Blosser explicitly searched for artifacts from the same core while Seeman and Connolly seem to have made fortuitous discoveries.

### 1.2. Fort Ancient and Stubbs earthworks

Fort Ancient is located on a ridgetop above the east bank of the Little Miami River in southwest Ohio (Fig. 1). The earthwork's walls range from one to seven meters in height while stretching for nearly six kilometers, though they are not continuous but divided by 67 prehistorically constructed gateways (Connolly 2004a). These wall segments form four architectural units; the North, Middle, and South Forts, and the Parallel Walls. Over 100 years of intermittent excavations at Fort Ancient have uncovered evidence for the staged construction of walls and mounds, human burials, intentionally constructed water features, house-like structures, a woodhenge, trash dumps, and several artifact caches (see chapters in Connolly and Lepper 2004). The materials for this study are taken from surface collections to the northwest of the earthwork in Gregory's Field; salvage excavations of numerous structure foundations (notably structures two and three) and a large pit feature (feature 144) in lots 17 and 18 of Gregory's Field; stone pavements, structure remains, and a refuse filled drainage feature near the Twin Mounds; remains of house-like structures, pit features, and midden deposits of the Interior Household Cluster (IHC); a gully trash dump in the North Fort; the Moorehead Circle woodhenge and oval feature; as well as Gateways 3, 7, 8, 12, 13, 14, and 84 in the North Fort and Gateways 18 and 58 in the Middle Fort that were the location of short term, probably ceremonially related activities (Miller 2014a, 2015).

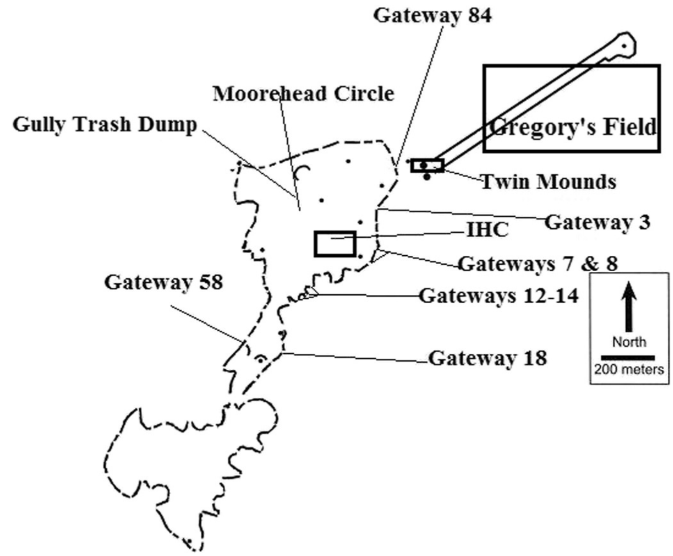


**Fig. 1.** Fort Ancient with areas mentioned in the text labeled.

The Stubbs Earthworks were located on a low terrace of the Little Miami River about 7 km downstream from Fort Ancient (Fig. 2). Stubbs was first mapped by in 1839 (Whittlesey 1851) but recent gravel mining, agriculture, and construction have largely destroyed the earthworks. As mapped by Whittlesey, Stubbs was a geometric earthwork enclosing a total area of about 20 ha. To the east of the main enclosure stood a series of linear earthworks which some have interpreted as a serpent effigy (Genheimer 1997:284–285). Whittlesey depicted two openings in the earthen walls, one in the southern-most section and one in the southwest corner, as well as a 550 m opening along the river bluff. Although salvage excavations conducted in the late 1990s and early 2000s at Stubbs produced extensive evidence of Middle Woodland activity—especially in the form of wooden architecture—most excavation areas contained more features than artifacts, with bladelets exceedingly rare (Cowan et al. 1999). The materials for this study were recovered from a large (1.5 m diameter by 90 cm depth) pit feature with three distinct layers of fill, and associated surface finds at the Smith Site (33 WA 362) as well as surface collections and test units associated with post molds and pit features at the Circle Overlook site (33 WA 765) (Miller 2014b).

While the methods, strategies, and goals of each of the above investigations varied, commonalities in recovery techniques did unite each of them. For those that employed surface collection (Gregory's Field at Fort Ancient as well as the Stubbs sites), every attempt was made to recover