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Chapter 7

Indigenous Native American Perspectives on Functions of Hopewell Bifaces from Mound 25, Hopewell Mound Group (33Ro27), Ross County, Ohio

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Several Ohio Hopewell ceremonial sites are being considered for inclusion on the UNESCO World Heritage List, where they would join the Pyramids of Giza, the Great Wall of China, Cahokia, and Stonehenge. The Hopewell Mound Group in Ross County, Ohio, is one of them (along with Newark Earthworks and Fort Ancient, see Ruby 2013). Euro-American settlers believed these monumental sites were the work of a lost civilization (Feder 2011; Silverberg 1968). Pioneer archaeologists accepted this myth (Atwater 1820; Squier and Davis 1848). After 1850, most agreed that Native Americans[1] built the mounds and earthworks (Lynott 2015), but as James Brown (2012:1) noted, some still believed that the mound builders were complex societies supported by agricultural surpluses (Thomas 1894:614–20).

Hopewell stamped pottery, figurines, platform pipes, bladelets, pearls, bear and shark teeth, and elaborate artifacts made of flint, obsidian, copper, shell, and mica were not just found in the Middle Ohio Valley (Griffin 1967, 1983; Hall 1997). However, the most elaborate earthworks and artifacts were found there. Ohio Valley mound building began with the Adena during the Early Woodland period (ca. 850–50 BC[2]). Hopewell was assigned to the Middle Woodland (ca. 150 BC–AD 450) period (Griffin 1967, 1983; Lepper 2005; Lynott 2015; Seeman 1992, 1996).

N'omi Greber (2003) found that most ^{14}C dates from Ohio Hopewell earthworks fall between 80 BC and AD 480.

WERE THE HOPEWELL THE FIRST FARMERS IN THE OHIO VALLEY?

In a recent lecture, William Lovis (2011) remarked that we need to examine *how do we know, or think we know, what we know* about early Native American farming. This is a simple question with a complex answer. Assumptions and opinions about early farmers in the Ohio Valley have been proposed that do not consider all of the available evidence. For example, we know that squash, maize, and beans were the "three sisters" in a venerable Native American farming tradition, but those plants were not domesticated at the same time. Three sisters farming was not practiced before the end of the thirteenth century, when domesticated beans (*Phaseolus vulgaris*) completed the triad (Hart and Lovis 2013; Hart et al. 2002).

Maize remains were recovered at some Hopewell sites, but the bone chemistry of individuals buried at them[3] is similar to Archaic and Woodland forager-gardeners, not that of members of Late Prehistoric (ca. AD 850–1550) Ohio Valley tribes and chiefdoms with established agricultural systems (Greenlee 2006; Smith 2009; Yerkes 2005). Even if the Hopewell were not maize farmers, could they have been sedentary agriculturalists living in small sites (rather than villages) growing native domesticated crops?

Some think that they were (Dancey and Pacheco 1997; Pacheco et al., this volume; Patton and Fahey, this volume; Prufer 1965; Wymer 1993, this volume), but is there any empirical evidence for this Hopewell farming system? Following Lovis, *how do we know, or think we know,* that it existed? In the Ohio Valley, after AD 900, there is evidence for significant maize consumption at Late Prehistoric sites (Greenlee 2006). Later in the thirteenth century, beans were also grown (Hart et al. 2002). There are large bell-shaped storage pits, flaked stone tools with "hoe polish," and more substantial dwellings at these villages. All of these cultural features are archaeological correlates of farming and sedentary lifeways (Binford 1990; Kelly et al. 2005; Walthall 1998; Yerkes 2005, 2006).

It should be noted that Bar-Yosef and Meadow (1995:51) stated that "assertions that one site resulted from year-round occupation and another from short-term seasonal use must be based solely on biological evidence and not on arguments about the presence or absence of permanent structures, storage facilities, burials, and heavy tools." Eitan Tchernov (1991a, 1991b, 1997) found that the best evidence for sedentism was the presence of commensal species like rodents and small birds in faunal assemblages.

Prehistoric rice rat (*Oryzomys palustris*) distributions were used by Vickery et al. (2016) as proxies for warmer climate phases in the Midwest. They noted that a few rice rat remains were found at several sites occupied before AD 1000, but that remains of the rodent were found at many more sites occupied after AD 1000. For Goslin (1951), Guilday (1961:3), and others (cited in Vickery et al. 2016:57), rice rats were commensal species attracted to refuse and stored foods at ancient agricultural sites, but Vickery et al. (2016:57–60) did not think that maize was their preferred food. Semken (2016:81–82), who disagrees with them, also describes rice rats as a commensal species, and notes that corn (maize) was stored for year-round use in almost all of the sites with rice rat remains listed in Vickery et al. (2016:Table 2, including 27 sites in the Ohio Valley; also see Murphy 1981; Parmalee and Shane 1970).

During the Late Middle Woodland period, a few rice rat elements were found at Salts Cave, Kentucky, Fairchance Mound, West Virginia, and the Jennison Guard site, Indiana. We know of no other Ohio Valley Hopewell sites where rice rat remains were found, even though this commensal species was present at that time (Vickery et al. 2016). If crop seeds and agricultural refuse were deposited in middens or pits at Hopewell sites, they were apparently only occupied for a short time, and the amount of stored food and accumulated refuse was not enough to attract rodents (Also see Kelly et al. 2005, for an ethnoarchaeological study of sedentism and refuse accumulation).

Paul Sciulli (1997) found that Ohio Valley Hopewell populations did not exhibit patterns of tooth cavities and dental wear associated with the high carbohydrate diets of farmers. Also, we know of no agricultural images in the corpus of Ohio Hopewell iconography, while agricultural activities and mythology are represented in Late Prehistoric images like the Middle Mississippian Birger and Keller figurines from the BBB Motor site near Cahokia (Milner et al. 1984:Plate 31). If the Hopewell were the first farmers in the Ohio Valley, why are the biological and cultural correlates of sedentary farming rare or absent at Hopewell settlements (Brown 2006; Koot 2012; Yerkes 1990, 2002, 2005, 2006)?

The transition from foraging to farming in the Ohio Valley was a long gradual process (cf. Pringle 1998). Hunter-gatherers are known to sow, harvest, and consume domesticated plants (Keeley 1995:259–67; Kelly 2013:Table 3–1; Murdock 1967), but sedentary village farmers use different tools, have different settlement patterns, and developed other systems of social organization. Biological and cultural evidence supports the characterization of Ohio Hopewell groups as complex, mobile, tribal societies, "low-level food producers" like their Archaic and Early

Woodland predecessors, who also hunted, fished, and gathered wild plants (Caldwell 1958:viii; Hall 1997:156; Lynott 2015:75; Smith 2001; Stoltman and Baerreis 1983:257–59; Yerkes 2006). Sedentary village farming in the Ohio Valley does not appear until after AD 900.

RITUAL, IDEOLOGY, AND TRADITION

The idea that the Hopewell were dispersed sedentary farmers without any ethnographic analogs, rather than mobile forager-gardener tribes contributes to the view that they were a remarkable culture that no longer exists. This denies the connection between the Hopewell and their Native American descendants. It also creates a detached past where people's lives were so different that there does not seem to be any connection between prehistory and the ethnographic present (Atalay 2012; McNiven 2016:29).

Hopewell ritual and ideology can be understood through comparison with historic Native American customs and traditions (Hall 1997:156). A better understanding of Hopewell lifeways is gained when the cultural content of Ohio Hopewell ritual (Brown 2006) is examined from an Indigenous perspective. In his definition of *cultural uniformitarianism*, Robert L. Hall stated that it is unlikely that anything in prehistoric ritual and ideology cannot be explained by the working of cultural processes known from firsthand knowledge of historic American Indian customs (1997:156). Hall (1977) also recognized that it is possible to infer a structure of symbolic meaning from archaeological remains. A century ago, employing what later became known as the *direct historical approach* (Steward 1942; Wedel 1938), Seneca archaeologist Arthur C. Parker (1909, 1918, 1922) showed how traditional Native American knowledge can be used to link prehistoric cultures with historic tribes (Willey and Sabloff 1993:126–27). Cultural uniformitarianism is an extension and elaboration of Parker's perspective. It is common in studies that "historicize" world views and extend the ethnographic present into the past (Atalay 2006, 2012; Baerreis 1961; McNiven 2016). It is appropriate for Hopewell research since in contemporary Native American traditions, mound building is viewed as a way to teach the young about cooperation, world view, and tribal origins. Hopewell mounds and earthworks are sacred sites that connect indigenous people with their ancestors. Cultural uniformitarianism provides a framework for our interpretations of Hopewell ceremonialism and the functions of large Hopewell bifaces by recognizing that the origins of many Native American rituals can be found in prehistory (Hall 1997; Marcus and Flannery 1994; McNiven 2016; Parker 1918).

There have been studies of Ohio Hopewell tribes that include examples from ethnography and history (Brown 2006; Byers 2004, 2011; Carr and Case 2005; Carr and McCord 2013, 2015; Lynott 2015; Romain 2009). However, our project was initiated by the Seneca Nation of Indians, who provided the financial support needed to study the function and symbolism of Hopewell artifacts and learn how they are related to rituals of the Seneca and other Native Americans. This study is a true collaboration between the Seneca tribe, archaeologists, and museum curators.

HOPEWELL MONUMENTS AND RITUAL ECONOMY

Robert L. Hall (1980, 1997) and James B. Griffin (1964, 1997) described Hopewell societies as dispersed egalitarian tribes. Consistent with historic Native American practices, Hopewell individuals gained prestige not by accumulating surplus food or wealth, but by giving gifts to others. They were complex tribes (Yerkes 2002, 2003), but their seasonal mobility (cf. Binford 1990; Cowan 2006; Walthall 1998) led to isolation and a need for social integration. Constructing monumental earthworks and participating in rituals helped keep tribe members connected by renewing and maintaining social and economic ties.

Exotic goods and foodstuffs were exchanged at Hopewell ceremonial centers, but the primary function of the earthworks seems to have been social, rather than economic. Hopewell earthworks have been described as transaction or redistribution centers for exotic artifacts and foods. Some believe that Hopewell exchange systems and their investment of labor in earthwork and mound construction developed so that dispersed groups could share food during times of scarcity (Brose 1979; Ford 1979; Wymer 1993). However, building earthworks and exchanging exotic items did not provide the Ohio Hopewell with an adaptive advantage over other Middle Woodland tribes. Contemporary Baumer groups (600 BC–AD 500) in the Lower Ohio Valley had similar subsistence systems, but they did not build earthworks or produce elaborate exotic artifacts (Jefferies and Butler 1982:21; Muller 1986:94–95, 108–17; Yerkes 1988:325). And yet their socioeconomic system was as effective and sustainable as the Hopewell system.

Victor Thompson (2016) provides another perspective on the benefits of earthwork construction with his application of resilience theory (Redman 2005) in his study of earthwork construction by fisher-gatherer-hunter societies in central Florida. He emphasized the ideological and historical aspects of a sustainable socioecological system that dates from 800 BC until the historic period. Thompson argues that large gatherings of people who engaged in earthwork construction renewed economic interdependencies through ritual, and also were able to produce wild food surpluses that mediated effects of environmental fluctuations (2016:315–16). There are similarities between the Okeechobee case and the Ohio Hopewell. In both, earthwork construction occurred on a local and on a regional scale (Bernardini 2004; Greber 2006; Lynott 2015; Ruby 2013). The rebuilding episodes at the Ohio Hopewell earthworks may be another example of the *landesque capital*, structures requiring maintenance (Brookfield 1984) that created the *sunk cost labor effects*, where people persist in actions even if there are negative costs (Janssen et al. 2003; Thompson 2016:315–16). For the Hopewell, the negative costs of earthwork construction were offset by social and spiritual benefits, and like in the Okeechobee basin case, the sunk cost and landesque capital of Ohio Hopewell earthworks were not strictly economic factors. They also include investments in rituals and production of elaborate symbolic items made of exotic raw materials. These activities were parts of a Hopewell *ritual economy* (Miller 2015; Spielmann 2002, 2008, 2009). However, these rituals also would have integrated members of dispersed Hopewell tribes (Bernardini 2004; Fortier 1998; Yerkes 2002, 2006).

Prior labor investment and environmental fluctuations may not have been the main motivations for dispersed Hopewell tribes to maintain and modify earthworks. They did not have to travel to them in order to increase their food supply and mitigate the effects of environmental fluctuations. The warm and mild climate during the Middle Woodland period in the Ohio Valley (Anderson 2001; Baker 2015; Vickery et al. 2016) allowed for expansion of oak savannahs and grasslands that could be maintained through burning (Smith 2009). Increases in nut production and improved habitat for game over a wide area could have provided an abundance of food. Less favorable climate after ca. AD 450 may have contributed to a decline in earthwork construction (Anderson 2001; Baker 2015; Comstock and Cook 2018; Griffin 1960; Vickery et al. 2016; Yerkes 1988), but it does not seem to be the primary cause.

Andrew Fortier (1998:357) suggested that Hopewell earthworks were rendezvous centers that operated like Great Basin Shoshone *fandangos*. Julian Steward (1938:237) described fandangos as gatherings that promoted social intercourse among mobile dispersed tribes without economic motivation. Earthworks were also like the Black River Falls, Wisconsin, pow-wow grounds, where the Ho-chunk (Winnebago) have gathered since historic times. Tribe members came to renew social ties and conduct their affairs before there was an official tribal administration (Loew 2001; Radin 1990). Ritual economy is an intriguing concept, but conducting proper ceremonies with appropriate ritual objects seems to have been much more important than economic gains. There were no Hopewell “merchant princes" sustained by agricultural surpluses (Hall 1997:156). Tribal leaders gained prestige by giving gifts to others.

Hopewell concerns about food security and resource availability did not lead to settlement nucleation at the earthworks. No dense clusters of large permanent villages grew up around them (Dancey and Pachecho 1997; Prufer 1964). Instead, small groups went to locations where resources were abundant during different seasons. Scheduled feasts, adoption ceremonies, and burial rituals held at the earthworks allowed dispersed tribe members to maintain their social and economic connections (Hall 1997; Seeman 1995; Yerkes 2002, 2005, 2006).

To better understand Hopewell ceremonialism and ritual economies, indigenous perspectives of cultural uniformitarianism provide the theoretical framework for our microwear and contextual analysis of nine large Hopewell bifaces from Mound 25 at Hopewell Mound Group that are curated at the Ohio History Connection (OHC), Columbus (Figure 1).

THE CONTEXT OF THE LARGE HOPEWELL BIFACES

Seven of nine large stemmed bifaces examined in this study are Ross Barbed points (Cowan and Greber 2002; Griffin 1965; Jeske and Brown 2012). Two obsidian bifaces did not have stems. Many believe that they all were ceremonial objects or offerings made by master flintknappers from exotic raw materials they obtained by travelling 4,827 km (3, 000 miles) to sources in what is now Yellowstone National Park and North Dakota (Lepper 2005:145; Lynott 2015:201). There is far less agreement about how they were used before they were deposited at Hopewell Mound Group.

Mound 25 is the largest known Hopewell mound, and is found within Hopewell Mound Group, one of the largest earthwork complexes in North America (covering 45 ha). Hopewell Mound Group contains three small enclosures, a woodhenge, and numerous mounds. It covers two terraces above the north fork of Paint Creek in Ross County, Ohio. The largest and most complete set of Hopewell artifacts and features were found there (Greber and Ruhl 1989; Lynott, 2009, 2015; Ruby 2013). Many spectacular finds came from Mound 25 (Figure 1), which in the 1850s was 152 m long and 10 m high. Then the mound was described as a cat or panther effigy with three conjoined lobes. The eight large obsidian bifaces in the sample (#2–9) were recovered during field work at Mound 25 by Warren K. Moorehead in 1892 when he was collecting exhibits for display at the World's Columbian Exposition in Chicago. The KRF biface (#1) was found in Burial 22 in 1924 by Henry C. Shetrone when he directed excavations at all visible

Figure 1. A. Location of Mound 25 inside semi-circular earthen enclosure at Hopewell Mound Group. Locations of Mounds 2 and 11 also shown. Scale and north arrow have been added. *Originally published by Shetrone in 1926.* **B**. sketch map of Moorehead's 1892 Mound 25 excavations showing Altar 1 and Altar 2 in sections 3 and 6. No scale on original. *After Moorehead, 1922, Plate XLVII.* **C**. Location of Burial 22 on Shetrone's plan map of Mound 25 at Hopewell Mound Group. Relative positions of the two altars on **B** were used to project the location of Altar 2 onto Shetrone's map. Altar 1 is on the original map. Metric scale added. *after Shetrone, 1926.*

mounds at Hopewell Mound Group for the Ohio Archaeological and Historical Society, which is now the Ohio History Connection (Greber and Ruhl 1989; Lynott 2015; Moorehead 1897, 1922; Ruby 2013; Shetrone 1926, 1930).

Context of the Knife River Flint (KRF) Biface (sample #1). The only biface in the sample that was found with an individual was the KRF biface at the left hand of a young male in Burial 22, a double interment in Mound 25. Descriptions can be found in Shetrone's 1924 field notes (page 14) and in his 1926 report (Shetrone 1926:79–81, Fig. 30). The burials were placed on, and covered by, a bed of bark on a small earthen platform enclosed by log-molds (Shetrone 1924:14, 1926:79). The heads lie to the southwest. There were only a few pearl beads with the young female, but an elogated rectangular strip of mica covered the thighs of both. Grave goods found with the young male included hundreds of pearl and shell beads, four grizzly bear canine teeth set with pearls, 22 perforated bear teeth, two rectangular copper plates, copper ear spools, two beaver incisors, two cut wolf jaws, and a polished cannel coal celt. A curved copper head plate was found between the two skulls (Shetrone 1924:14, 1926:80). Skeletons and copper artifacts were poorly preserved, but the flint biface was in fine condition. A "beautifully wrought spear-point, nine inches long and exceedingly thin and symetrical, made from a translucent amber-colored chalcedony" (Shetrone 1926:80). The lithic raw material was identified as KRF by OHC and Hopewell Culture National Historical Park staff. This was confirmed by comparison with samples of KRF from North Dakota provided by Stanley Ahler (1986).

In a mitochrondrial DNA (mtDNA) study of the Ohio Hopewell, Lisa Mills (2003) found that 34 burials at Hopewell Mound Group included individuals from four out of five documented Native American lineages (haplotypes). The mtDNA of the male in Burial 22 was haplotype A, the most common lineage (50% of 22 individuals), while the female was haplotype D (as were 27% of the individuals in her sample). The genetic differences in the pair, while significant, are not unexpected. Intertribal marriages and adoptions are common in Native American tribes (Hall 1997).

Context of the Obsidian Bifaces (samples #2–9). The eight obsidian bifaces are either part of OHC's collection from Moorehead's Mound 25 excavations (Samples #2, #3, and #9), or were obtained in an exchange with the Field Museum (Samples #4–8; Table 3.1). It is likely that they were part of a deposit of ca. 150 bifaces and biface fragments from Altar 2 at the base of Mound 25 (some are illustrated in Moorehead 1922). Charles Willoughby described Altar 2 as a large clay basin measuring 2.1 x 1.5 m at its outer edges with a 38 cm deep 51 x 102 cm inner basin (Greber and Ruhl 1989:77). The deposit on Altar 2 also included textiles, pipes, and copper, mica, shell, bear claws, and bone offerings. Many offerings were burned and broken (Greber and Ruhl 1989:78). The altars were associated with *great houses* (Greber 1979) in the north central area of Mound 25 that were covered early in the mound construction sequence (Greber and Ruhl 1989:52, 73). The great houses seem to have been used for rituals before they were dismantled and mounded over.

Studies of Obsidian Debitage from Mound 11, Hopewell Mound Group. Moorehead (1922) and Willoughby (in Greber and Ruhl 1989) stated that bifaces in Mound 25 were made of obsidian from Yellowstone National Park. The large quantities of obsidian debitage from biface production found at Hopewell Mound Group, particularly in Mound 11 (Figure 1A), suggest that obsidian blocks were transported to the Ohio Valley from western sources rather than finished bifaces (Carr and Case 2005:621; Spielmann 2008:65). Analysis of debitage from Mound 11 showed that large bifacial thinning flakes were detached by accomplished flint knappers (Cowan and Greber 2002). This obsidian was obtained from outcrops, not stream cobbles, and was minimally tested before transport. There was variation in visual features suggesting that the Mound 11 obsidian may be from different outcrops (Cowan and Greber 2002). Dates on two charcoal samples associated with the debitage were calibrated dates using the Calib 7.0.4 program (http://calib.org/calib/). They had 1δ ranges of AD 257–96 (p =.39) and AD 321–92 (p =.61) for the first sample, and AD 221–334 (p = 1.0) for the second. A T-test showed no significant difference between these two samples (T = 0.781, Xi^2 = 3.84, 1 df, 95%). The pooled mean for the two samples is AD 205.

Obsidian hydration dates for nine Mound 11 flakes do not overlap the calibrated ^{14}C dates, and range from ca. 380–60 BC, and from ca. AD 510–700. Debitage seems to have been curated for several centuries before it became a ritual deposit in Mound 11 (Stevenson, Abdelrehim, and Novak 2004). The debitage was not from production of all of the large obsidian bifaces by a single master flint knapper as Shetrone (1926, 1930) and Griffin (1983:263) had suggested. It includes debitage from production of bifaces at many different times by several knappers who used obsidian from different western sources (Cowan and Greber 2002; Griffin et al. 1969; Hatch et al. 1990; Hughes 1992, 2006; Stevenson, Abdelrehim, and Novak 2004; Stevenson, Scheetz, and Hatch 1992).

Radiocarbon Dates from Mound 25. Radiocarbon dates from Mound 25 at Hopewell Mound Group include three samples (C-139, bark from burial 248; C-137, shell from burial 260/261; and C-136, wood charcoal from Altar 1) that were some of the first samples run using the solid carbon method (Arnold and Libby 1951;

Libby 1955). These samples had higher variance (200–250 years) than six other samples from Mound 25 dated by Beta Analytic (with variance of 50 years) published in Greber (2003:Table 6.1). No dates are from Altar 2 or burial 22 in Mound 25 where the obsidian and KRF bifaces were found. Beta Analytic samples were also taken from Altar 1 (the other large clay basin on the Mound 25 floor, see Figure 3.1B, C) and from burials 260/261 (with the famous deposit of copper objects) in section 3 (Moorehead 1922). When these dates were calibrated using Calib Rev 7.0.4. (1δ), there was significant variation between solid carbon and Beta dates. Some variation may be due to multiple intercepts on the calibration curve as well as the dating methods. For example, the solid carbon sample from Altar 1 (C-136) has ranges (1δ) of 197 BC–AD 257 cal ($p = 0.96$), AD 295–321 cal ($p = 0.04$), and AD 285–86 ($p = 0.003$). A T-test showed that calibrated ages (1δ) for two samples from Altar 1 run by Beta Analytic (Beta 115623 and 115624) are the same (T = 0.98, $Xi^2 = 3.84$. 1 df. 95%). Their mean pooled age is AD 225. One Beta date (Beta 115625) is significantly different than the other two (T = 15.7, $Xi^2 = 5.99$. 2df, with ranges (1δ) from 3 BC–AD 85 ($p = 0.85$), 10–24 BC ($p = 0.09$), and 28–37 BC ($p = 0.06$)).

Calibrated dates on charcoal found with the obsidian debitage in Mound 11 (see above) and the two younger Altar 1 calibrated dates are statistically the same (T = 1.96, $Xi^2 = 7.81$. 3df, 95%). These dates are not directly associated with large Hopewell bifaces in Altar 2, but if Altar 2 and Altar 1 are contemporary, ritual offerings there and in Mound 11 *may* have been deposited during the same ceremonial cycles (ca. AD 215, the pooled mean for all four samples). However, the production of large Hopewell bifaces may have been much earlier and they may have been used for several generations before they were finally deposited on Altar 2.

METHODS OF ANALYSIS

Microwear and technological analyses of the KNF and obsidian bifaces were conducted in order to determine: (1) if they had been hafted or utilized, (2) if used, the type of material that was worked and the pattern of use (e.g., cutting or scraping). Distinctive micropolishes, striations, and damage scars form on the edges of stone tools when they are used to perform specific tasks (cutting, scraping, etc.) on certain types of materials (bone, wood, hide, etc.). These microwear traces are visible under incident light at magnifications from 50x to 200x. Tool function is determined by visual comparison of microwear on artifacts with traces on replicas used in experiments on a variety of materials (Keeley 1980; Pepín 2018; Yerkes 1987) and photographs of wear traces on experimental obsidian artifacts in Dr. Jacques Chabot's comparative collection at Université Laval, Quebec (Pepín 2018).

THERMAL ALTERATION EXPERIMENTS WITH OBSIDIAN BIFACE REPLICAS

Willoughby commented on the intense heat of fires on altars in Mound 25. They were so hot that they melted obsidian fragments and transformed them into "light grey porous pumice stone" (Greber and Ruhl 1989:76–77). Thermal alteration experiments were carried out on a biface and a biface fragment made by Albert Pecora III using obsidian from Glass Buttes, Oregon. The replicas were heated in a kiln able to reach 1000°C, but the kiln did not have a temperature gauge. Temperatures reached in the experiments had to be estimated from published descriptions of obsidian heating under controlled conditions (Loyd et al. 2002). Obsidian replicas glowed red after one hour. This also occurred at temperatures of 720°C in the published experiments. Heat-crazing or "vesiculation" and thermal fractures were noted on the replicas after three hours in the kiln. This change occurred between 850–900°C in published experiments (Nakazawa 2002; Steffen 2002:173). After four hours, there were no macroscopic changes to the biface base, but the complete obsidian biface was transformed into the light grey "pumice stone" described by Willoughby. Shackley and Dillian (2002) noted that this does not happen until temperatures of at least 900°C are reached.

RESULTS

Microwear analysis results are summarized in Table 1. None of the bifaces in the sample had any microwear traces that matched any of the wear traces on experimental obsidian artifacts in Dr. Jacques Chabot's comparative collection at Université Laval, Quebec or on other experimental replicas (Pepín 2018). The experimental tools had been used for everyday activities like butchering animals, digging soil, or working wood, bone, or antler.

All of the eight obsidian bifaces were broken, three were snapped (#3, 8, 9) and four (#2, 4, 5, 7) were shattered (Table 1). They had been glued back together, filled in with wax, and painted with black pigment when they were prepared for exhibits (Moorehead 1922:132). Prehension traces suggested that most bifaces had been handled, but it is not clear if it was by prehistoric Native Americans or by early conservators. The best evidence for hafting was visible on bifaces with stems or bases that had not been restored (Table 1). William Pickard of OHC noted that several of the bifaces seem to have been ground before the final thinning. There was microscopic evidence for this, and also for prehension, hafting, and thermal alternation (Figures 2–5). The results are similar to other studies of flaked stone ritual artifacts where microwear was associated with hafting or storage in sheaths rather than everyday activities (Keeley 1982; Sievert 1990).

Table 1. Results of Microwear Analysis of Nine Large Hopewell Bifaces from Mound 25 at Hopewell Mound Group (33Ro27), Ross County, Ohio.

Sample #	OHC catalog #	Location in Mound 25	Measurements in millimeters					Shape or Form of Biface	Shape of Stem	Blank was Ground	Thermally Altered	Haft Traces	Restored and/or filled-in
			GL	*Widest point*	*At notches*	*At base*	GTh.						
Knife River Flint (KRF) Biface													
1	A283/205	Burial 22	222	73	25.5	25	7.5	Notched point	rectan-gular	X		X	
Obsidian Bifaces													
2	A283/382	altar 2?	230	102	35	42	13	Curved blade, notched	diamond	?	X	X	X
3	A283/381	altar 2?	207	90			13	diamond-shaped base		X	X	X	X
4	A283/322-A	altar 2	310	145	39	48	13	Notched point	diamond	X	X	?	X
5	A283/322-B	altar 2	363.5	138	44	53	13	Notched point	diamond	?	X	?	X
6	A283/322-G	altar 2	209	103	32	41	13	Notched point	diamond	X	X	X	X
7	A283/322-C	altar 2	404	138	50	64	18	Notched point	diamond	X	X	?	X
8	A283/322-H	altar 2	317	126	41	44	10	Notched point	diamond	X	X	X	X
9	A283/384	altar 2?	169	68			9.7	Curved blade		X	X	?	X

Sample #	
Knife River Flint (KRF) Biface	**Description of microwear traces and residues**
1	Polish dense on edges and ridges, more diffuse inward, parallel to edge, hafted, possibly retouched, reddish and bluish residue.
Obsidian Bifaces	
2	Superficial streaks on ventral face, hafting traces on dorsal face, crazing from heating, surface is dull.
3	Edge damage, grinding and perpendicular streaks, wear traces are blunt and rounded, thermal alteration and residues, hafting traces.
4	Edge damage, grinding and abrasion on both surfaces, fractured by heating, possible hafting traces.
5	Edge damage and rounding, random streaks perpendicular to edges may be grinding, heating cracks, residues, possible hafting traces.
6	Few wear traces, grinding, superficial streaks, microflaking on edges, reddish residue (wax?), thermal alteration, but no fracturing, and hafting traces.
7	Few wear traces, some perpendicular streaks and parallel traces, some grinding and abrasion, thermal alteration (and wax residue) on surface.
8	Few wear traces, edge-damage and rounding, streaks, hafting traces on stem, thermal alteration, and discoloration on distal end.
9	Few wear traces, some streaks, grinding, abrasion and dulling, not heated, possible hafting traces.

* Artifacts are on display at the Ohio History Connection (OHC) Museum, Columbus, Ohio. All bifaces are complete with parallel flake scars from bifacial thinning; blades are straight in cross-section (little curvature). GL= greatest length (mm); Thermally Altered=heated to high temperature; GTh.= Greatest thickness (mm); Restored and/or filled in=broken biface was glued together and gaps were filled-in and painted black; diamond-shaped stems are similar to Turkey-tail points;?=possible grinding, thermal alteration, or hafting traces.

The prehension traces on the KRF biface from burial 22 in Mound 25 (sample #1, Figure 2) are similar to handling wear on flint tool replicas (Keeley 1980; Rots 2010; Yerkes 1987). Prehension traces on obsidian bifaces were difficult to identify, especially on ones that were burned, fractured, and restored. Hafting traces were similar to traces on flint tool replicas hafted in wooden handles with hide or sinew (Rots 2010). Friction between the biface stem and bindings causes hafting wear on stone tools. These are striations and abrasion traces on obsidian bifaces. The "bright spot" visible on the base of the KRF biface may have been caused by flint microflakes in the binding rubbing against the biface face. Friction caused when the KRF biface was put in and taken out of a sheath may have produced the microwear. However, "sheath wear" is characterized by numerous striations (Keeley 1982; Plisson and Beugnier 2007). Only a few short striations are visible on the KRF biface (Figure 2), but there were more striae on the obsidian artifacts (Figures 4 and 5). Some of these could be sheath wear. However, most striations on the blades of the obsidian bifaces seem to be from hafting or grinding.

The large KRF biface (#1) was not fractured and had not been burned. Its greatest length was 22.2 cm. Its greatest width was 7.3 cm. The stem was 2.55 cm wide at the basal notches, and 2.45 cm at the base. It was only 0.75 cm thick (Table 1). It was hafted, and had been handled. The male in burial 22 may have made the KRF biface himself or he may have obtained it indirectly through prestige chain exchange (Clark 1984:185).

Heat Fracturing and Thermal Alteration of Obsidian Bifaces. The greatest lengths of the eight obsidian bifaces ranged from 16.9 to 40.4 cm. The greatest widths were from 6.8 to 14.5 cm. The Ross Barbed points were from 3.2 to 4.4 cm wide at their basal notches, and 4.2–6.4 cm wide at the widest part of their diamond-shaped stems. They were 0.97–1.8 cm thick (Table 1). All were broken or fractured and seem to have been subjected to intense heat. While none of the Hopewell obsidian bifaces in our study were transformed into pumice, thermal features and vesiculation from very high temperatures were visible on many of them (Table 1, Figures 3 and 4). Willoughby commented that highly flammable fat, grease and wood fuel on the altars at the base of Mound 25 created intense heat that melted obsidian fragments and melted and fused copper (Geber and Ruhl 1989:77–78). The obsidian bifaces in the sample were probably burned and fractured on Altar 2 (Greber and Ruhl 1989:76–77; Moorehead 1922). James Gunderson (2012) estimated that burned Hopewell stone pipes at the Mound City site were incinerated at temperatures as high as 1000°C. The thermal alteration features on Hopewell obsidian bifaces

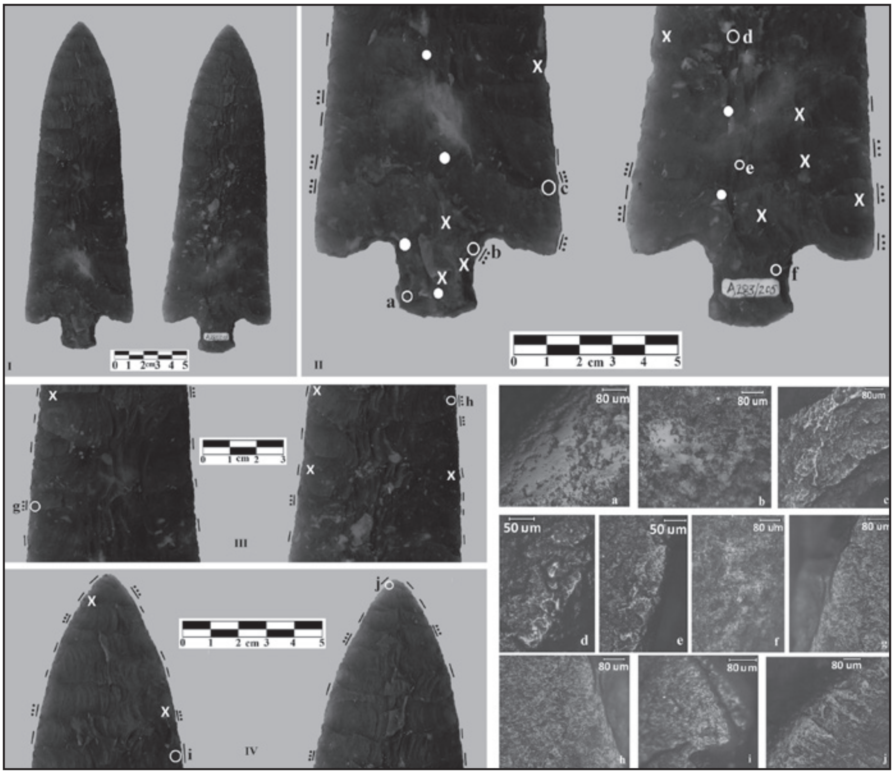


Figure 2. Flint knapping, grinding, and prehension traces on Knife River Flint (KRF) biface (sample #1, OHC cat. #A283/205) from burial 22 in Mound 25 at Hopewell Mound Group. Circles show locations of photomicrographs. Black lines and white Xs show locations of knapping and stone grinding traces. Black lines with three dots and white dots mark hafting and prehension traces. **I**: dorsal (left) and ventral (right) faces of KRF biface. **II**: close-up of base of KRF biface. **III**: close-up of medial section. **IV**: close-up of distal section. **a**: stone-on-stone grinding polish and striae on left edge of stem. **b**: "bright spot," stone-on-stone microwear, and hide hafting traces on stem. **c**: wood polish and greasy hide hafting traces in from right edge of base. **d**: wood hafting polish or "sheath wear" on ventral face 7 cm from base of stem. **e**: hide hafting traces on flake scar ridges 3.5 cm from base of stem. **f**: stone-on-stone grinding polish and striae in from right lateral edge of stem. **g**,**h**: bright stone, antler, or bone knapping microwear and "greasy" dull prehension traces on lateral edges. **i**: bright stone-on-stone grinding traces and striae parallel to right lateral edge. **j**: bright flat stone-on-stone grinding polish, striae, and edge rounding on distal edge. Magnifications of all but d and e are 125x, scales are 80 microns. Magnifications of d and e are 187.5x, scales are 50 microns. Photos by Yerkes and Pépin.

matched the traces on experimental replicas heated to at least 900°C (Figures 3 and 4). This confirmed earlier observations that Ohio Hopewell tribe members could build fires in clay basin altars that reached temperatures hot enough to melt copper artifacts and fracture obsidian bifaces and stone pipes.

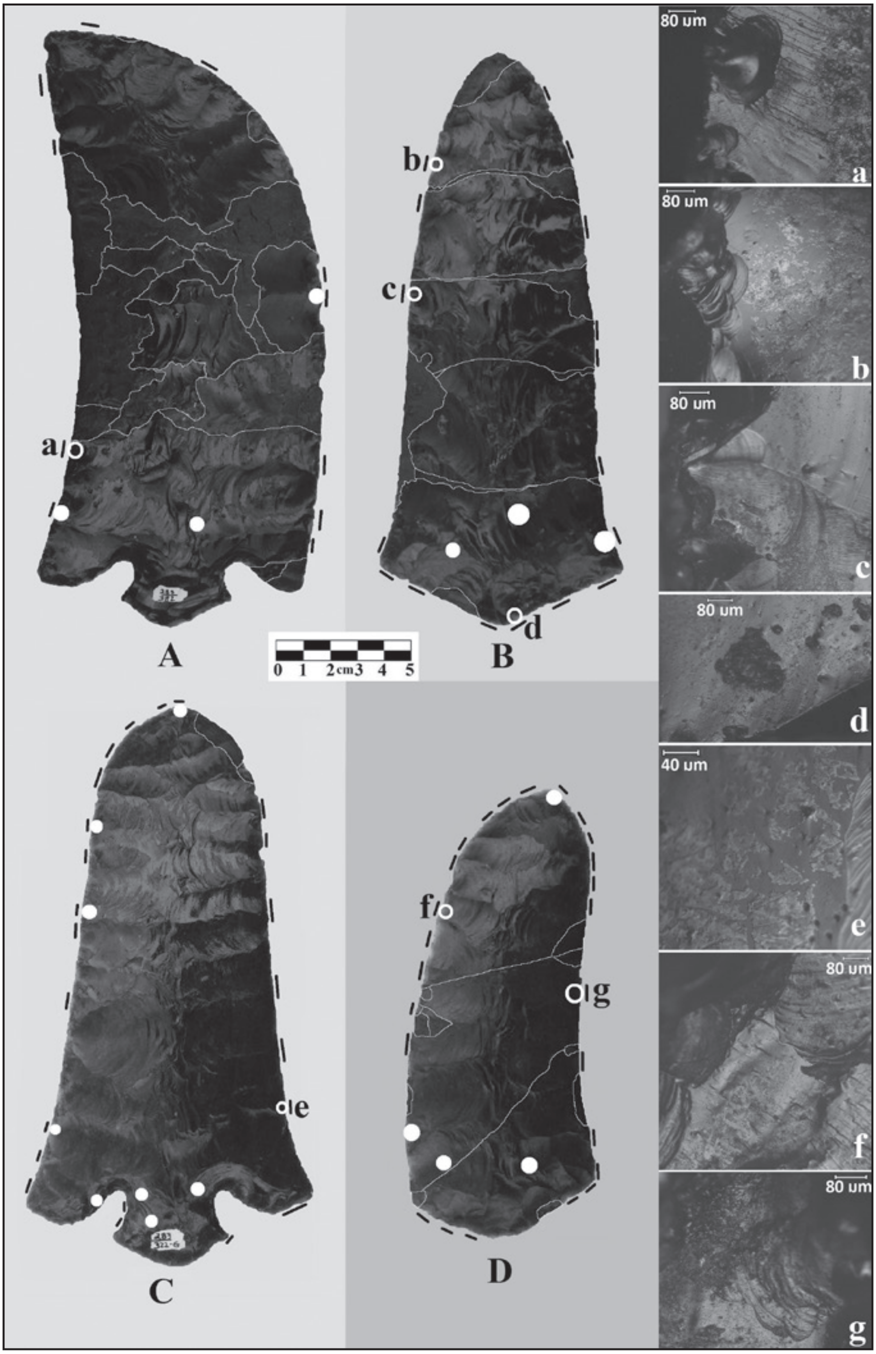
Grinding and Hafting Traces on Obsidian Bifaces. Obsidian bifaces were made from large straight biface blanks. The flint and obsidian bifaces in our sample were ground down before final thinning and retouching. The result was very large, but very thin and flat bifaces (Table 1). The microscopic evidence for grinding and hafting on the eight large obsidian bifaces in the sample consisted of striae, scratches, and edge-damage (Figures 4a, d and 5) that were similar to traces on flint tool replicas that were hafted in wooden shafts with hide or sinew (Rots 2010). Dark residues on bases of biface #3 and #6 may be mastic from hafting (Figures 3d and 5b).

Ritual Killing of Hopewell Bifaces by Snapping. Three obsidian bifaces seem to have been intentionally broken. Unstemmed Biface #3 was broken into five sections (Figure 3B), #8, a stemmed Ross Barbed point, and #9, an unstemmed curved biface, were both snapped into three segments (Figures 3D, 4D, and 5F). Lowery (2012, 2013a, 2013b) reconstructed a method of breaking or "killing" Hopewell and Adena bifaces using wooden vises. The three Hopewell obsidian bifaces in the Mound 25 sample may have also been broken intentionally in this fashion before they were placed on the altar fires.

DISCUSSION

Microscopic evidence supports suggestions by Greber and Ruhl (1989), Moorehead (1897, 1922), and Shetrone (1924, 1926, 1930) that (1) large Hopewell bifaces

Figure 3. (opposite page) Thermal alteration traces on Hopewell obsidian bifaces from Mound 25 at Hopewell Mound Group. Restored fractured areas outlined in white. Circles: locations of photomicrographs. Black lines and white dots: areas with thermal ateration. **A**: sample #2, OHC cat. #A283/382, ventral face. **B**: #3, OHC cat. #A283/381, dorsal, biface snapped into 5 segments. **C**: #6, OHC cat. #A283/322G, ventral. **D**: #9, OHC cat. #A283/384, dorsal, biface snapped into 3 segments. **a**: micropotlids, vesiculation, and crazing on left edge of A. **b**,**c**: micropotlids, vesiculation, and crazing on left edge of B. **d**: micropotlids, vesiculation, and dark residues (mastic from hafting?) on base of B. **e**: crazing and vesiculation on right edge of C. **f**,**g**: micropotlids and vesiculation on edges of D. Magnifications of all but e are 125x, scales are 80 microns. Magnification of e is 250x, scale is 40 microns. The same microscopic thermal alteration features were seen on experimental obsidian bifaces and flakes heated in kilns to temperatures of 850–900°C. Photos by Yerkes and Pépin.



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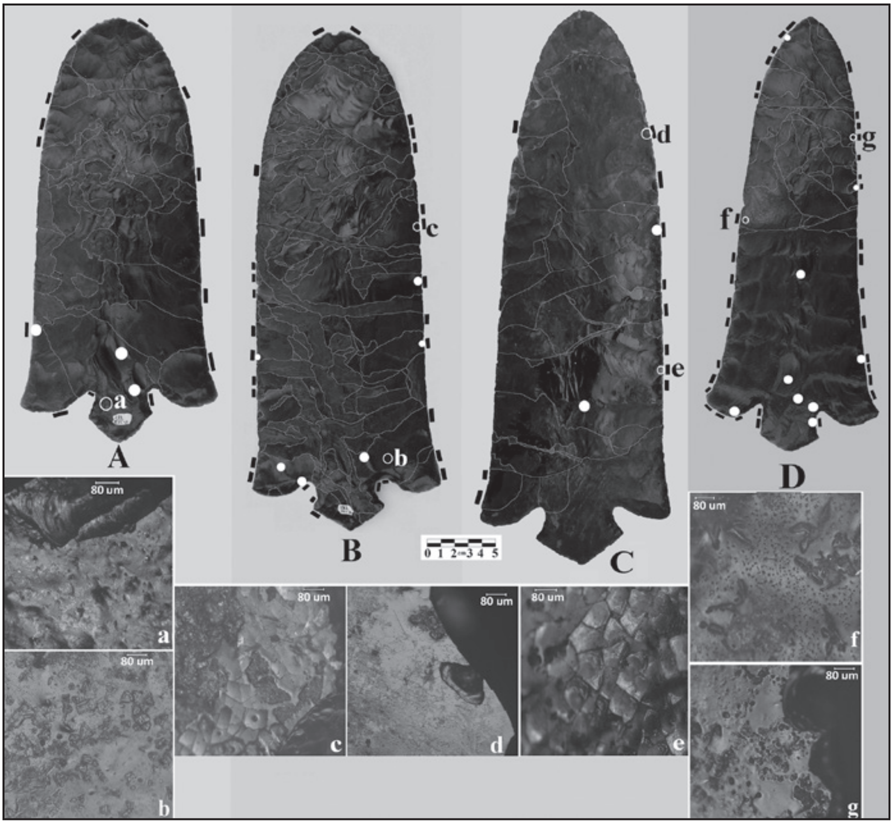

Figure 4. Thermal alteration on Hopewell obsidian bifaces from Altar 2 in Mound 25 at Hopewell Mound Group. Restored areas outlined in white. Circles: locations of photomicrographs. Black lines and white dots: areas with thermal ateration. **A**: sample #4, OHC cat. #A283/322A, dorsal face. **B**: #5, OHC cat. #A283/322B, ventral. **C**: #7, OHC cat. #A283/322C, dorsal. **D**: #8, OHC cat. #A283/322H, dorsal, biface snapped into 3 segments. **a**: thermal alteration and possible hafting traces (parallel striations) on stem of **A**. **b**: fractures, crazing and vesiculation on base of **B**. **c**: fracturing and crazing, and vesiticulation from intense heating on right lateral edge of **B**. **d**: micropotlids, crazing, and vesiculation from heating and possible grinding traces (striae and scratches) on lateral edge of **C**. This could also be "sheath wear." **e**: geometric thermal fracture patterns on lateral edge of **C**. **f, g**: crazing, micropotlids and vesiculation from intense heating on lateral edges of **D**. Magnifications are 125x, scales are 80 microns. The same microscopic thermal alteration features were seen on experimental obsidian bifaces and flakes heated in kilns to temperatures of 850–900°C. Photos by Yerkes and Pépin.

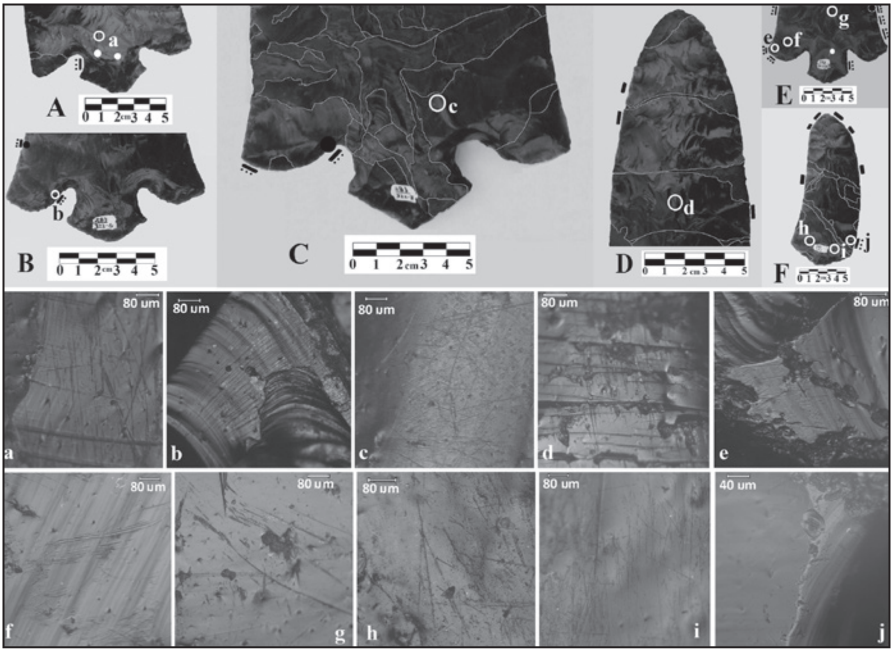

Figure 5. Hafting and grinding traces on Hopewell obsidian bifaces from Mound 25 at Hopewell Mound Group. Restored areas outlined in white. Circles: locations of photomicrographs. Black lines with three dots and large black dots: hafting traces. Black lines: grinding traces. **A**: sample #2, OHC cat. #A283/382, dorsal face of base. **B**: #6, OHC cat. #A283/322g, ventral, base. **C**: #5, OHC cat. #A283/322B, ventral, base. **D**: #3, OHC cat. #A283/381, dorsal face of medial and distal end. **E**: #8, OHC cat. #A283/322H, ventral, base. **F**: #9, OHC cat. #A283/384, ventral. **a**: striae and scratches on **A** that may be from hafting. **b**: striae on **B** and gritty residue that may be hafting mastic. **c**: multiple striae and scratches on **C** from hafting or grinding. **d**: striae from grinding or "sheath wear" on **D**. **e, f**: parallel striae on **E** that may be hafting traces. **g, h, i**: scratches and striae on **E** and **F** that may be from hafting traces or "sheath wear." **j**: striations and edge-rounding on right edge of base of **F** from hafting. Magnifications are 125x, scales are 80 microns for all but j, which is 250x and 40 microns. Photos by Yerkes and Pépin.

made of flint and obsidian were ground before final flint knapping to thin and finish them, (2) the bifaces had been hafted, and may have also been kept in sheaths, (3) obsidian bifaces were fractured, and thermally altered when placed on altars where fires were kindled that reached temperatures as high as 900°C, and (4) some bifaces may have been snapped or "killed" before they were placed on the fires (Table 1).

Results from this study and other investigations do not support the assumption that powerful Hopewell chiefs supported by agricultural surpluses oversaw rituals at the earthworks and controlled production and trade in exotic artifacts (Brown, 2006; Koot 2012; Yerkes 2002, 2005, 2006). However, others have proposed that Hopewell "shamans" organized rituals and oversaw the construction of large earthworks and the production of exotic artifacts (Brown 2006; Byers 2004, 2011; Romain 2009). In achievement-based tribes, understanding of the supernatural enhanced the standing and authority of some individuals (Goldman 1970; Speilmann 2002). There are descriptions of ritual specialists in hunter-gatherer tribes who use visions and altered states to contact spirits, heal the sick, and control animals and the weather (Brown 2006:477; Lewis-Williams 2002:133). Erica Bourguignon (1973:30) noted that the ritual specialists do not impersonate spirits, but retain their identities and obtain their healing powers and knowledge of the supernatural through their visions.

Hopewell tribe members who organized rituals at earthworks and travelled to distant sources to obtain raw materials for elaborate artifacts used in the rituals could have been seeking greater spiritual knowledge and trying to increase their life force (Goldman 1970; Spielmann 2002, 2009), but they could have done these things to help the tribe as well as themselves. They may not have been ritual specialists, but could have been members of ritual societies. In the Iroquois longhouse and Ho-Chunk medicine lodge, for example, False-face and Midewiwin ceremonies are not organized or led by "shamans," but by a group of ritual society members who have detailed knowledge of the ceremonies, legends, and traditions of the tribe (Hall 1997; Parker 1909, 1922). The visions of some members of ritual societies may have motived them to undertake the long journeys to obtain raw materials for the symbolic objects they needed for their ceremonies (Speilmann 2009), but they would gain prestige by giving the exotic items as gifts or offerings (Hall 1997:156). When they died, they may have been honored for their generosity with more elaborate burial ceremonies.

All but two obsidian bifaces in our sample (#3 and #9) were Ross Barbed points, large thin bifaces with distinctive stems (Griffin 1965:117). The base of the stem of the barbed KRF biface (#1) is square. It is not a "classic" Ross Barbed point since their bases are diamond-shaped. The bases of Ross Barbed points resemble the bases of thin "turkey-tail" points found at Red Ochre (1500–500 BC) and Early Adena (500–150 BC) sites in the Ohio Valley and upper Great Lakes (Justice 1987:173–79). Turkey-tail points are thin (0.65–1.0 cm) and straight like the

Hopewell bifaces, but smaller and 10–20 cm long (Justice 1987:252). They often are made of Wyandotte chert from northern Kentucky and southern Indiana. This is the same lithic raw material used for the 11,000 biface preforms (and the single stemmed biface) found in Mound 2 at Hopewell Mound Group (Figure 1; Moorehead 1897, 1922:95–96; Munson and Munson 1990; Vickery 1996).

Hall (1983) argued that turkey tail points were used as bullroarers attached to cords and spun around the head to make their roaring sound. North American bullroarers were used in initiations, and are associated with the spirits of north winds, lightning, and storms (Hall 1983:84–87). Ross Barbed points are larger than turkey-tails. They may have been too heavy for bullroarers, but may have been used in initiations and had similar symbolic associations. Diamond-shaped stems on both point types may represent the four corners of the world.

Hall (1983:78–84) discussed cognitive aspects of flint in Native North America. The tongue of the Aztec Sun Stone is a fish-tailed flint knife, and is associated with creation. Aztec *tecpatl* (sacrificial knives) came from the goddess Itzapapalotl (Obsidian Knife Butterfly), who shattered when she was thrown into a fire. In a Ho-Chunk Hare myth, the source of flint on earth comes from arrowheads scattered when Hare chased and clubbed grandfather Flint, and finally killed him. In Iroquois myth, Tawiskaro (Flint) was the second born (evil) twin of the daughter of the Sky Woman with a heart of ice or flint (Parker 1922:9–10). Flint's blood was turned into stone fragments when he was killed by his brother. Hall notes that Willoughby (1935) suggested that carved bone designs from Mound 25 at Hopewell Mound Group represent the Great Hare that has been associated with flint and characterized as the lord of the afterworld. Others think that it is an image of a deer, and related to the Hopewell copper deer headdresses (Greber and Ruhl 1989:227), or even a two-headed raptor (Giles 2013). A Great Deer was also a creation of the Great Hare in some myths (Hall 1997:136).

There are associations of flint with ice, glass, and crystal, and with "cold hearted" malevolent spirits in Native American legends, but flint, and glass (like obsidian) are also associated with fire. Obsidian may be a symbol for the thermal features at Yellowstone Park. In Seneca myth, the origin of the False Face Society is traced to a hunter who gained the wisdom of the last of the Genosgwa, Stone Giants or Stone Coats (Hall 1983:84; Parker 1909:108–81, 1922:394–401). There also are fire altars in Seneca Medicine Lodges (Parker 1922:499–51). Burning and fracturing of the large obsidian bifaces on the fires in Altar 2 in Mound 25 may be related to returning them to their origin from volcanic fires.

Hafting traces on the large bifaces suggest that they were attached to handles or poles. If they were hafted to long poles and carried in processions, as shown in an illustration by William Turner published by Martha Potter Otto (Potter 1968:39), their large size and distinctive shapes would have made them easier to see. Since Hopewell tribes had no real villages, these rituals were held at Hopewell earthworks. Long poles are still used in Iroquoian False-Face Society rituals and processions at their settlements, but large bifaces are not attached to to them. Apparently the skills needed to produce these large exotic artifacts have been lost over time (Figure 6).

No two large Hopewell bifaces are exactly alike. The variation may reflect the personal visions of ritual society members who made them. Variation in Hopewell ritual expression may be a defining feature. None of the large Hopewell earthworks are exactly the same, and it is very rare to find two identical Hopewell pipes, mica or copper cutouts, or decorated pots. Just like the distinctive false-face masks made by members of Iroquoian healing societies, each elaborate exotic Hopewell artifact seems to reflect the individual vision of its maker (Greber and Ruhl 1989; Hughes 2006; Moorehead 1922; Shetrone 1926). Sourcing studies on obsidian flakes in the Mound 11 deposit showed they came from several different western outcrops (Stevenson et al. 2004). This was not debitage from production of hundreds of bifaces by a single master flint knapper, but curated thinning flakes from many episodes of biface production. Obsidian hydration dates and radiocarbon dates on charcoal associated with the debitage suggest considerable time depth for obsidian biface production. While the large Hopewell bifaces have not been directly dated, they may have been passed down from generation to generation until they were burned on Altar 2 at the base of Mound 25 at Hopewell Mound Group.

CONCLUSIONS

Like most decorated Hopewell pottery found at Middle Ohio Valley Hopewell earthworks (Stoltman 2015), the large KRF flint and obsidian bifaces in our sample seem to have been made at or near the earthworks. We know of only one Hopewell obsidian biface found at Yellowstone National Park, and that biface base from site 48YE381 is a Snyders Point base (Hale and Livers 2013:13; Justice 1987:201–4), not a Ross Barbed point like the ones deposited in Mound 25. There is no evidence at the western obsidian outcrops that Ross Barbed points were made there.

For Caldwell (1964) and Hall (1997), peaceful processes facilitated exchange of materials and ideas throughout a broad *Hopewellian Interaction Sphere*. Shared ideas, values, and patterns for distinctive Hopewell artifacts (like large flint and obsidian bifaces) of the *Hopewellian Great Tradition* linked regional *small traditions*

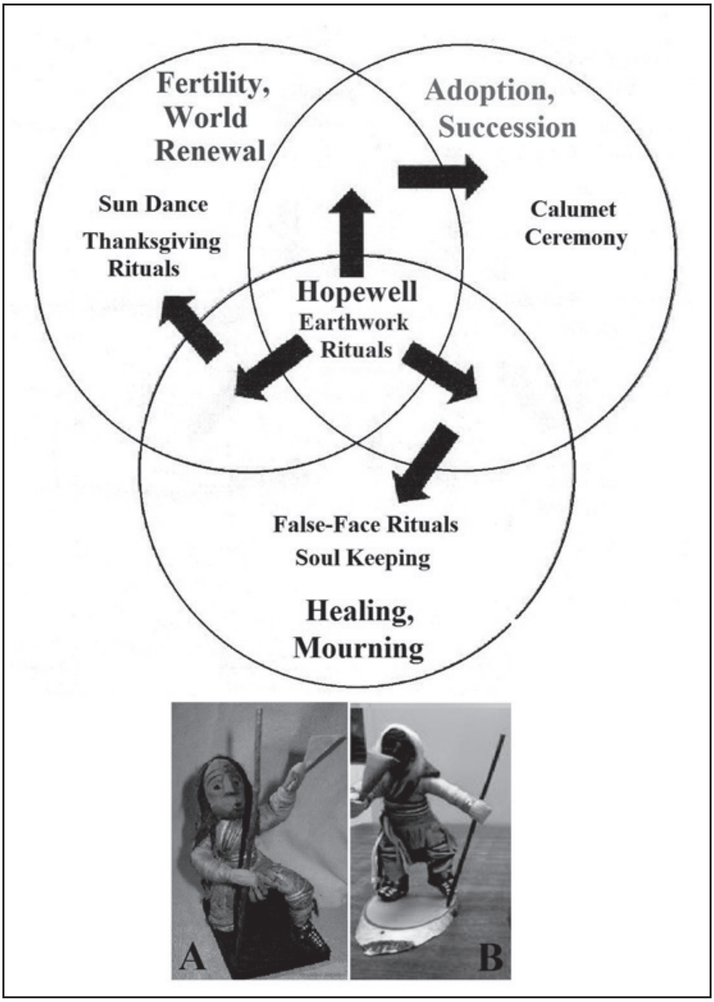

Figure 6. Top: Venn diagram illustrating how components of rituals held at Hopewell earthworks, which may have served as *surrogate villages* for dispersed mobile tribes, could have been disassociated and incorporated into specific world renewal, adoption, healing, and mourning rituals conducted at real villages by late prehistoric, historic, and contemporary Native American tribes. *Adapted from Hall 1997:Figure 19.3; also see Chafe 1961, Parker 1909.* **Bottom**: Corn-husk dolls of Iroquoian False-Face Society members with long poles. During the time of the Hopewell tribes, large bifaces may have been attached to the poles and used in similar rituals. *Photos A&B by Jay Toth.*

such as Ohio Hopewell, and Illinois Hopewell. Each manifestation of Hopewell is different because each is based on a regional tradition. The *Hopewell Interaction Sphere* was a network that linked Woodland tribes. Interaction between tribes allowed ideas and materials to move "without great hindrance over great stretches of the North American Continent" (Hall 1997:156). Ohio Hopewell tribe members traveling to distant sources to obtain lithic raw materials for the large bifaces may not have been hindered by the "hostile tribes" described by Moorehead (1922:133). Indeed, the route they followed may have been the same one that Lewis and Clark travelled at the beginning of the nineteenth century without great hindrance (Lynott 2015:141). The Ohio Hopewell may have carried platform pipes that served the same peaceful purpose as later calumets or "peace pipes" (Hall 1977:499–518). The Hopewell had the means to ensure safe travel on their long journeys out west.

The large KBF biface was not broken or burned. It may have belonged to the male in Burial 22 below Mound 25 at Hopewell Mound Group. The fact that it was not burned, but placed with an individual may mean that the young male was a member of a ritual healing society who was honored when he died and buried with the symbols and ritual objects that he made and used during his lifetime, or had received as gifts. The different ways that the flint and obsidian bifaces were finally deposited may have symbolic signficance, but it also illustrates the variation in how rituals of the Hopewell Great Tradition were conducted by members of different ritual societies from different tribes (as reflected in the genetic diversity of the individuals buried in Hopewell mounds, and varying stable isotope levels, see Beehr 2011; Mills 2003).

Robert L. Hall recognized that like later Native American ceremonies, Hopewell rituals emphasized fertility, creation stories, initiation, adoption, healing, world renewal, and mourning (Figure 6). Hall (1979:258–65; 1997:59–167) described how historic Native American ceremonies can be traced back to Hopewell rituals even if the Woodland rituals had changed over time. Jay Toth suggests that the large bifaces were hafted to poles like the ones used in Iroquoian False-Face rituals and processions (Figure 6; also see Parker 1909).

Hall (1983:84) and Parker (1909:180–81, 1922:394–401) mentioned the Seneca myth for the origin of the False Face Society which is traced to a hunter who gained the wisdom of the last of the *Genosgwa* (Stone Giants or Stone Coats) in his cave. This is an example of some of the rituals described by Lewis-Williams (2002:133) and attributed to the Hopewell by Brown (2006) and Romain (2009).

False Face Society rituals include processions with poles, but in modern rituals, nothing is attached to the poles. This may have happened because stone tool production methods were lost or forgotten over time. There is microscopic evidence that the nine large Hopewell bifaces were hafted. We may never know if they were hafted to poles similar to ones still used in False Face Society rituals; however, we can propose that their large size suggests that they were intended to be displayed and seen at some distance in Hopewell rituals where there were large numbers of people present (Potter 1968:39).

The Ohio Hopewell did not live in "real" villages (Brown 2012; Dancey and Pacheco 1997; Yerkes 1990, 2002, 2005, 2006). Rituals were held inside great houses or ceremonial structures at large earthworks, outdoors at smaller enclosures, or in designated parts of large earthworks (Greber 1979; Greber and Ruhl 1989:62–63). Bernadini (2004) concluded that mobilizing labor needed to construct Hopewell earthworks would require large social networks. Tribe members who built each of them may have participated in the construction of many earthworks during their lifetimes. He concluded that earthworks did not function as village surrogates for single Hopewell tribes. However, large earthworks may have served as temporary *surrogate villages* for rituals and ceremonies that were held at a time when there were no real villages. In later times the rituals would be conducted within real Late Prehistoric and Historic villages (Figure 6).

Today, Native American ceremonies that are associated with world renewal, adoption, initiation, healing, and mourning are still held within ritual lodges within settlements and outdoors at sacred sites. In Late Prehistoric and Early Historic times, they were held in the ceremonial or medicine lodges within villages. Chafe (1961) and Parker (1909, 1922) describe some examples of Seneca rituals in the lodges. Hall (1997) presents examples from many different tribes. It is likely that during the Middle Woodland period these kinds of rituals were conducted inside great houses, larger ceremonial structures, or within the enclosures found at earthworks like Hopewell Mound Group. The large bifaces examined in this study may have been used in some of those ceremonies before they were buried with individuals (#1), or incinerated along with other ceremonial objects on altars beneath Mound 25 at Hopewell Mound Group (#2–9).

Genetic studies (Bolnick and Smith 2007; Mills 2003) showed that individuals buried at Hopewell Mound Group included members of 4 out of 5 documented Native American lineages. Many contemporary Native American tribes have genetic and cultural ties to the Hopewell. Cultural uniformitarianism links their rituals and traditions to Hopewell ceremonies. No new myths about the Hopewell are needed to explain Hopewell phenomena. Rather than creating lost societies with features, settlements, and ritual practices that have no ethnographic analogs, more collaboration and engagement between archaeologists and Native Americans is needed to better understand the motivation for the construction of large earthworks and organization of elaborate rituals by the tribes that we call the Hopewell (Lynott 2015:258).

ACKNOWLEDGMENTS

This research would not have been possible without generous funding and support from the Seneca Nation of Indians. This allowed Ariane Pépin to come to Columbus from Quèbec and complete the microwear and technological analysis with Yerkes. Brad Lepper, Bill Pickard, and Linda Pansing of the Ohio History Connection arranged loans of the bifaces for study and provided logistical support and background information. Jacques Chabot provided images of wear traces on obsidian tool replicas and access to his microwear comparative collection at Université Laval, Quebec. Albert Pecora III produced the obsidian bifaces used in the thermal experiments. Stanley Ahler provided KBF samples from North Dakota quarry sites. Logan Miller provided valuable comments on an earlier draft.

DEDICATION

This research is dedicated to the memory of Erica Bourguignon, N'omi B. Greber, Robert L. Hall, and Mark J. Lynott.

NOTES

1. We don't know the true identities of the Native American tribes who built these remarkable monuments. Since the nineteenth century, they have been called the Hopewell, since the Hopewell Mound Group type site was on land owned by M. C. Hopewell (Greber and Ruhl 1989: 11; Hall 1997:155).

2. These dates are from Lepper (2005: vi-vii). They are based on conventional uncalibrated radiocarbon dates and diagnostic artifacts.

3. Levels of δ13C in burials at Edwin Harness and Seip indicated that Hopewell tribe members did not consume very much maize. It is only after AD 900 that bone chemistry data show that significant amounts of maize were consumed by inhabitants of the Ohio Valley (Greenlee 2006).

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