

OHIO ARCHAEOLOGIST

VOLUME 38

NO. 4

FALL 1988



Published by

THE
ARCHAEOLOGICAL
SOCIETY
OF OHIO

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President's Column

What is it about archaeology that attracts so many people's interest? Steve Parker and I have given twenty talks over the last couple years on an archaeological dig. One of the first statements that we usually hear is "I have always wanted to participate in an archaeological dig!" Their reasons were all pretty much the same as Steve and my reasons for digging; the anticipation and thrill of finding something. To the novice, this is as far as they really think an archaeological dig through. They do not consider the hard work that follows a dig—the cataloging of artifacts, the permanent records that must be filled out, etc. Professional and good amateur archaeologists carry this one, and sometimes two, steps further. First, they write a report on where, when, what and how the material was recovered. Unfortunately, too often this is where the process stops. The material from the dig goes into a dark corner of an institution or an individual's basement. They do not go the one final, most important, step publishing their reports, pictures and conclusion of their dig. I realize that professional archaeologist do publish more than we probably know. This being in other professional letters and journals that the amateur archaeologist doesn't have access to. I personally believe that not publishing a report on an archaeological dig or find is no better than pot hunting a site. Archaeology is like a large jig-saw puzzle. Every time we pick up an artifact, whether broken/unbroken, we have a piece of the puzzle. You may have an idea or artifact that will help solve the many unanswered questions that archaeology presents us. What better way to share your knowledge than through your own magazine, the Ohio Archaeologist. This magazine offers the professional archaeologist a place, free of charge, to publish and share their letters or reports. It offers the same opportunity to the amateur archaeologist. The first excuse for not writing a report is that one is not a writer. If you belong to one of our fifteen chapters, then you probably have help right there. If all else fails, do the report the best you can. Send it to Robert Converse and we will get someone to edit it for you.

We have the largest state archaeological society, the best magazine, the best people and with your help and participation we can only get better.

Donald Casto

Front Cover

The Richmondale Pipe. Made of gneiss, this pipe, the effigy of a human hand holding a tubular pipe, was found with an Adena burial near Richmondale, Ross County, Ohio. See accompanying article on pages 4-5.

The Richmondale Pipe

By

Robert N. Converse

199 Converse Drive, Plain City, Ohio 43064

The unique pipe shown in the front color plate and in Figs. 1-4 is one of the truly remarkable archaeological finds made in the last 75 years. It was found by Don Channel along with Paul Childers in Jefferson Township, Ross County, Ohio, near the small town of Richmondale. The construction of a farm lane to a lower terrace in the Scioto River valley exposed and partially destroyed a human burial. Accompanying the skeleton were two late Adena points (Fig. 5), several Adena blades, and this remarkable pipe—the sculpture of a human hand holding a tubular pipe.

The flint artifacts found with this burial are unquestionably Adena, and just as surely late Adena. Each of the points has well defined barbs, a characteristic not occurring on most Adena points, and considered to be a late Adena development. Unfortunately, the blades were not available for examination.

So far as is known, the Richmondale pipe is the only one of its kind. Effigy pipes are notoriously absent from nearly all Adena contexts, there being only five or six of any kind known in all Adena. Of course, the most publicized is the famous "Adena Pipe" which has been illustrated in numerous publications and may well be the best known prehistoric artifact in North America. It was found in the original Adena mound on the estate of Thomas Worthington near Chillicothe in 1901. The mound contained over sixty burials and among the artifacts recovered was this famous pipe. However, were it not for its context, the Adena Pipe would probably be considered Hopewell rather than Adena. This Hopewell-appearing pipe—the sculpture of a human dwarf—is the only one of its kind and cannot be duplicated in either Adena or Hopewell.

Two other Adena effigies are also tubular pipes made in the image of a shoveler duck. The first was found in the 1930's when the Engelwood mound near Dayton was leveled by a bulldozer for construction of a dam. The second is nearly identical to the Engelwood pipe, also being the effigy of a shoveler duck, and was taken from the Welcome mound in West Virginia by Frank M. Setzler in the 1950's. (Setzler-1961)

Other Adena effigies include the McBride pipe (Potter-1961)—the effigy of a parakeet on the end of a tubular pipe found in a mound in Butler County, Ohio. Two effigies reputedly came from the Saylor Park mound in Cincinnati—the effigy of a wolf and a bird. Finally, a tubular pipe carved with a raptorial bird holding a human baby in its claws in

the Meuser Collection reportedly came from a mound in Jackson County, not far distant from Richmondale (Converse-).

The Richmondale pipe is unique in that it is the only pipe from an Adena context representing a portion of the human body. It portrays a human right hand holding a blocked end tubular pipe. The fingers and thumb are faithfully sculptured and are proportionately and anatomically correct.

Blocked end tubular pipes are classic Adena artifacts, and the pipe held in this human hand also has a constricted partition. Facing away from the smoker—at the heel of the hand—the bowl cavity is $\frac{9}{16}$ inches in diameter and is $1\frac{1}{16}$ inches deep. Drilling was accomplished by two holes of different diameter, the larger hole penetrating to a depth of 1 inch with a $\frac{7}{16}$ inch hole completing the final $\frac{9}{16}$ inch depth. This double drilling leaves an offset or ring in the bowl cavity of about $\frac{1}{16}$ inch. On the smoker's side—toward the thumb—the hole is $\frac{7}{16}$ inches in diameter and $1\frac{5}{16}$ inches deep. A partition, meant to keep the smoking material out of the smoker's mouth, is approximately $\frac{1}{8}$ inch thick with a small $\frac{1}{8}$ inch hole connecting the two cavities.

Prehistoric pipes are rarely made of gneiss, the material from which the Richmondale pipe is fashioned. Gneiss is formed when granite is subjected to intense heat which partially melts its quartz/feldspar/biotite mica ingredients which are stretched and pulled leaving streaks or lines in its structure. The stone is found in various shades of color, mineral content, and degree of metamorphosis. The gneiss in the Richmondale pipe is pinkish/brown in color—perhaps selected to simulate human skin color—and its elongated crystals are plainly visible. Even though gneiss appears to have cleavage planes, its heat-fused composition obviates this characteristic. Undoubtedly, it is a difficult stone to shape, thus, the sculptor chose for a medium a stone which is tough and nearly intractable. Nevertheless, the aboriginal artisan who sculptured the Richmondale pipe left us a remarkable example of prehistoric art.

References

Setzler, Frank M.

1961 Welcome Mound and the Effigy Pipe. *Ohio Archaeologist*, Vol. 11, No. 1, Columbus.

Potter, Martha

1961 The McBride Effigy. *Ohio Archaeologist*, Vol. 11, No. 2, Columbus.

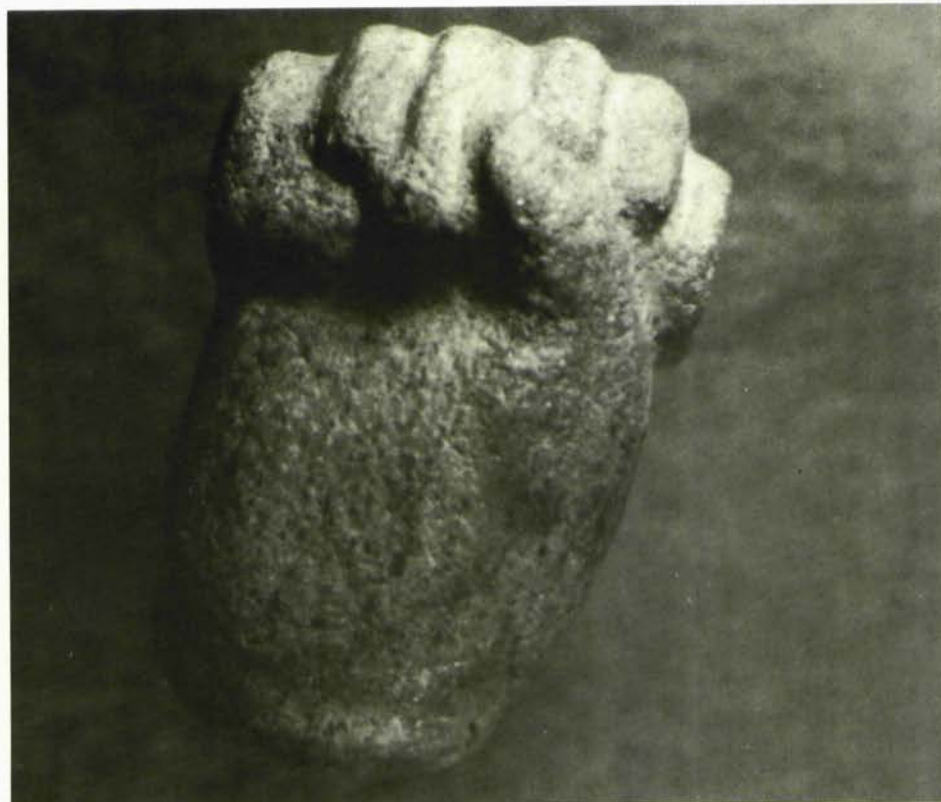


Fig. 1 (Converse) Illustration showing the effigy of a human fist holding a tubular pipe in its grasp.



Fig. 2 (Converse) Pipe as seen from the top.



Fig. 3 (Converse) View of the back of the pipe.



Fig. 4 (Converse) Pipe as seen from the end which held the smoking material. The blocked portion, with it's small constricted aperture to transmit smoke, can be seen in the center.

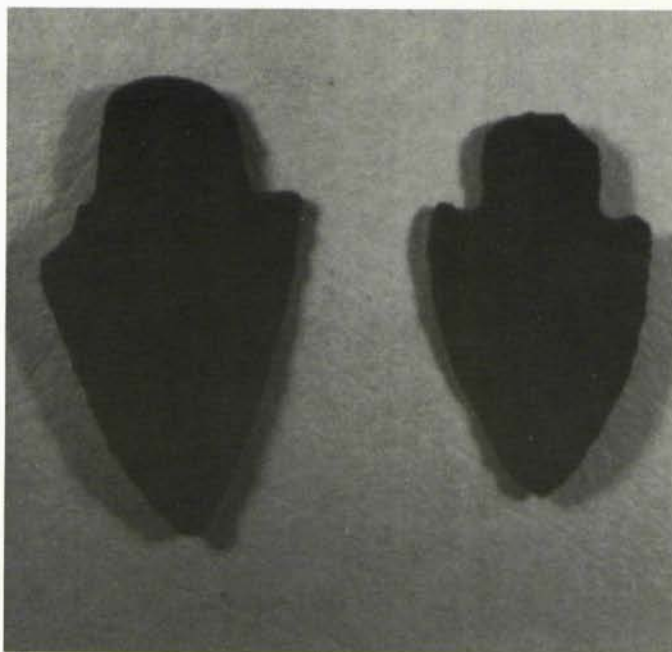


Fig. 5 (Converse) Two adena points of Upper Mercer flint which were also found with the burial.

Four-Holed Rectangular Gorget

By
Walter J. Sperry
Mount Vernon, Ohio

Beyond a doubt, this rare four-holed rectangular gorget is one of my most satisfying personal field finds. I found it February 20, 1983 on my family farm in a tractor tire mark, and it is most fortunate that it is still intact. It is a little over $\frac{1}{4}$ " thick. There are only two minor scratches on this piece from cultivation.

The gorget is $4\frac{1}{2}$ " long and varies in width from $1\frac{5}{16}$ " to $1\frac{3}{8}$ ". This piece of slate is quite unusual in itself since the

reverse side is grey-green with black banding and banding is not present on the obverse side.

This gorget is Adena in origin. Holes one and three are probably the original holes and they are drilled from one side only. The end next to hole one is the salvaged end. It shows some evidence of sawing before the salvage process was completed. Holes two and four were probably drilled after salvaging.

They are drilled from *both* ends. Only hole number two shows any wear. Interestingly, this wear is in the direction of hole number one.

This find greatly reaffirms my belief that there are still many outstanding artifacts to be found.

Reference

Converse, Robert N.
1978 Ohio Slate Types, Columbus, Ohio.

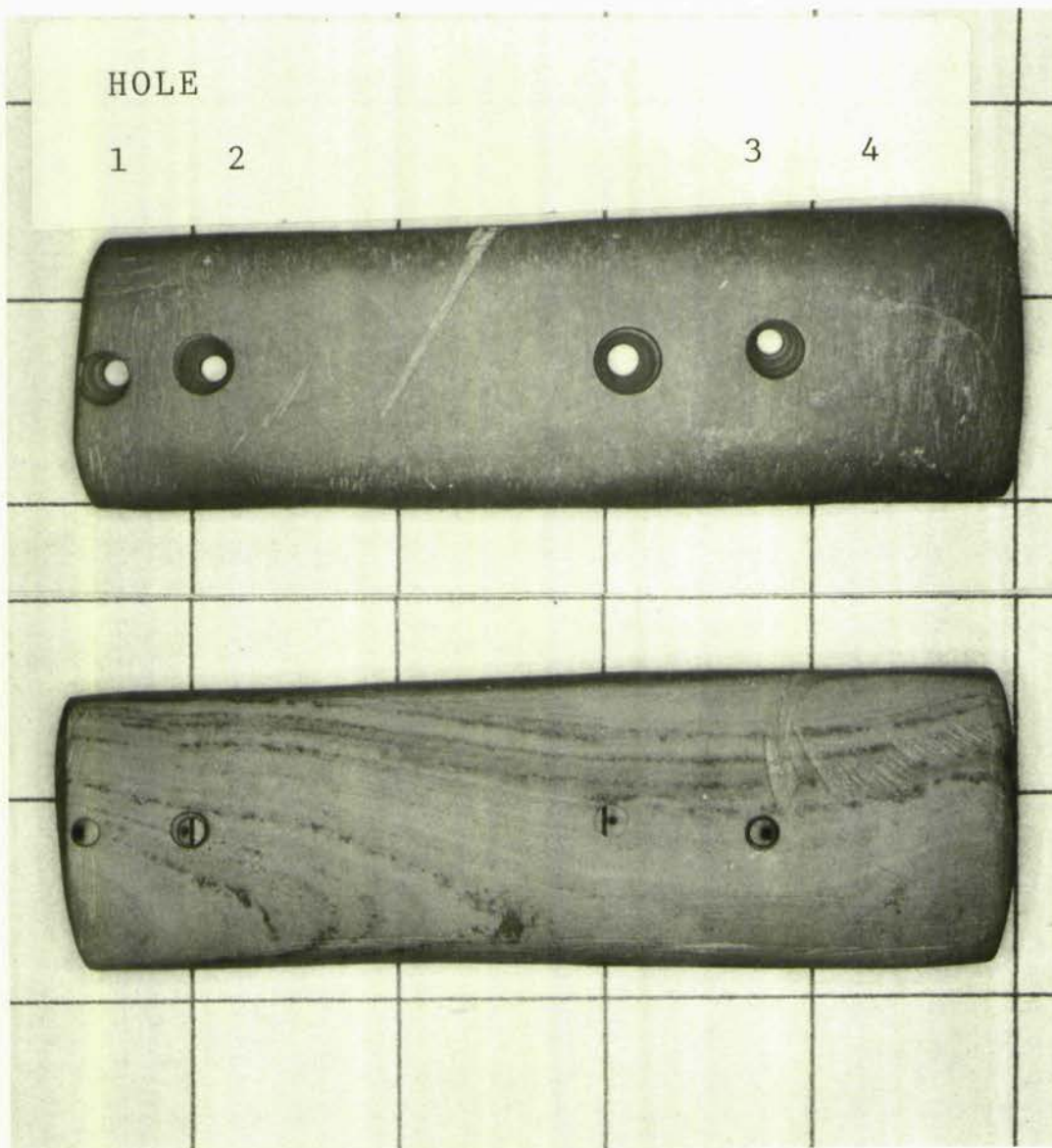


Fig. 1 (Sperry) Obverse and reverse of gorget from Knox County.

Two Fine Slate Pieces

By
Steve Fuller
Wooster, Ohio

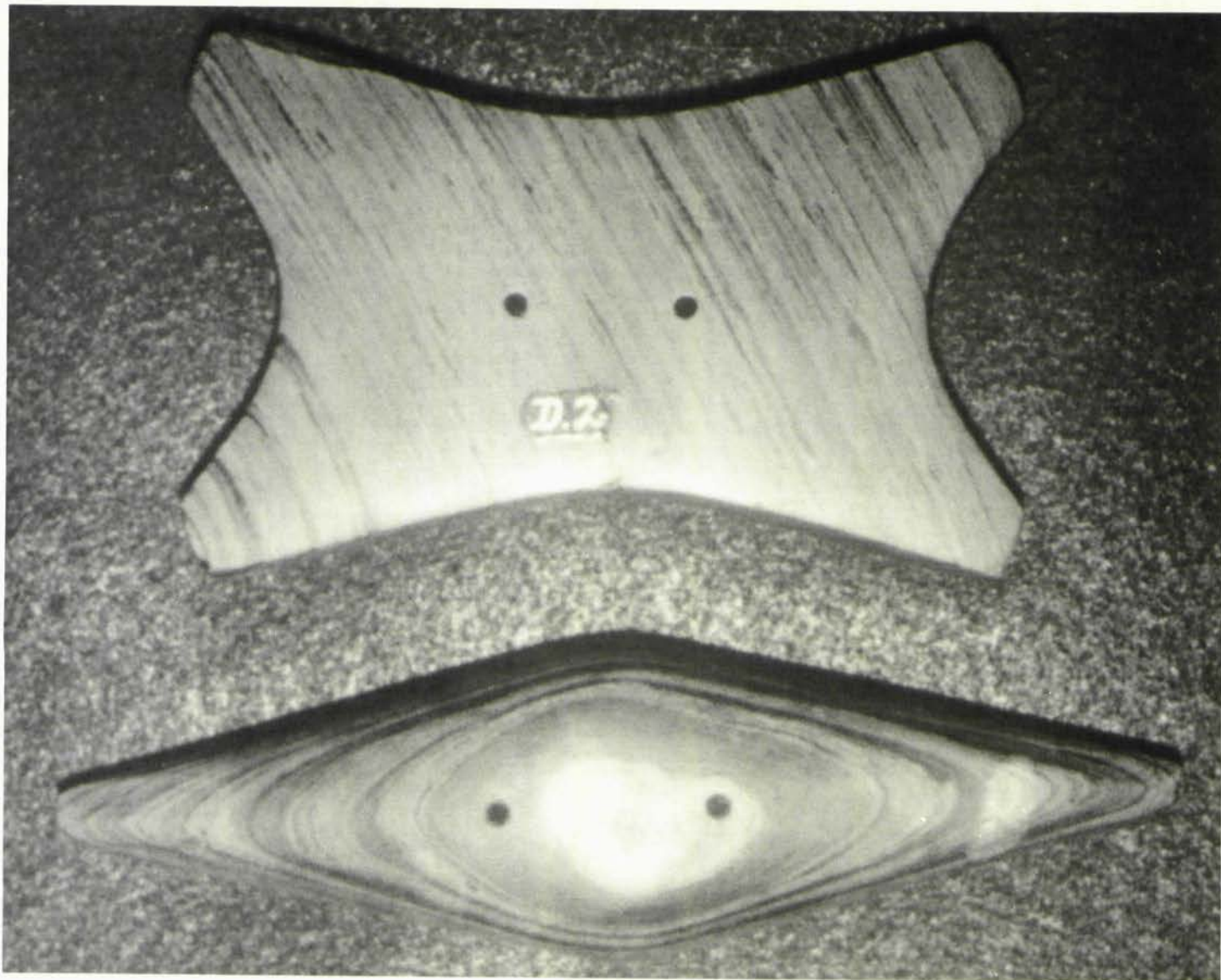


Fig. 1 (Fuller) Quadriconcave Adena gorget found by Clyde Robinson in 1910 while hoeing corn on his father's farm 4 miles northeast of Hepburn near the Marion-Hardin county line. It is $4\frac{3}{4}$ inches long and was collected by Dean Driskill in 1974 who had first seen it in 1936.

Bottom—Expanded Center Adena gorget $6\frac{1}{4}$ inches long. Collected originally by Archie and Pete Diller from a Mr. Clure of LaFayette, Ohio in the 1950's.

Rat-Tailed Spears: Another Look

By
Phillip R. Shriver
Miami University

The Old Copper Complex of the Archaic period has been described as a "local cultural variant" [primarily eastern Wisconsin, though old copper types have also been found in neighboring states and across a large portion of North America]. (See Wittry and Ritzenthaler, 1957: 311; Wittry 1951: 1-2; 1957: 204-205; Ritzenthaler, 1957: 185). Carbon 14 dates obtained from samples of charred wood found in cremation pits in Wisconsin Old Copper Complex sites (principally at Oconto, some 3 miles above the entry of the Oconto River into Green Bay) range from 5600 plus or minus 400 years up to 7510 plus or minus 340 years. (See Wittry and Ritzenthaler, 1957: 320-321.) Highsmith suggests that Old Copper may even have gotten its start in Wisconsin 8500 to 9000 years ago. (1985: 607.)

Among the diagnostic artifacts of the Old Copper Complex are rat-tailed spear points (see Figure 1), socketed spear-points (see Figure 2), and socketed "spuds" (the latter probably used as axes attached to elk antler handles—see Figure 3), all fashioned of copper from the Lake Superior region, obtained either as glacial drift nuggets or from open pit mining on the Keweenaw Peninsula or Isle Royale. (See Wittry, 1951: 1-2; 1957: 204-205.)

Robert E. Ritzenthaler of the Wisconsin Public Museum, at one time editor of the Wisconsin Archaeological Society, has noted that "the metal and ornaments of the Bronze Age of Europe [have] presented a somewhat analogous situation to what we have with the Old Copper Complex." (1957: 207.) With W. C. McKern (1942: 153-169) and others, he has postulated that there may even have been "affiliations of Old Copper... with more northerly peoples of the [North American] continent, or even extending into western Asia. Similar shape types have been found in Ritchie's Laurentian material in north-eastern New York... Rat-tailed spear points are reported for Athabaskan sites in Alaska... Socketed axes and gouges of metal from western Asia provide a further clue to the possible source of the shapes of Old Copper implements." (See Ritzenthaler, 1957: 203.)

In the William M. Jacka Collection of the Heritage Hall Museum in Lakeside, Ohio, are two rat-tailed spears identified in that museum's records as having a Michigan provenance, spears earlier pictured in the Fall 1987 issue of the *Ohio Archaeologist*. (See Shriver, 1987: 26-27). One is ovate with a cylindrical rat-tail and is 4 1/16 inches long (see

Figure 4); the other is boldly barbed and socketed with a square-in-cross-section rat-tail affixed in its socket, with an overall length of 6 3/4 inches. (See Figure 5. Interesting, one of the diagnostic tools of the Old Copper Complex is a square-in-cross-section awl.)

I am indebted to Gale V. Highsmith of Milwaukee for calling my attention to possible mis-identification of those spears as belonging to the Old Copper Complex. He has pointed out that Lake Superior copper (often 99% pure) contains faint traces of silver which tend to appear in Old Copper artifacts, generally subject to heavy acid erosion and patination, as raised hair-line ridges, discernible because of the differential erosion of copper and silver. He has noted the absence of such lines or ridges, indeed, the over-all light patination, of the two pieces in the Jacka Collection, and has questioned whether they might be from the Luristan area of Asia Minor with an age of approximately 5000-5500 years. He has pointed out that a number of Luristan artifacts of bronze came into this country around the time of the Second World War and subsequently began to appear in some American collections as Old Copper Complex artifacts. (See Highsmith, October 29, November 16, 1987; and 1985: 517, 537, 580, 581, 593. See also Figure 6.)

In a return to the Heritage Hall Museum on August 12, 1988, I was able to again examine the two points in question. Neither is heavily patinated. Neither shows the raised lines or ridges indicating traces of silver and resultant differential erosion.

Though not all Old Copper spears are heavily patinated (see the report by Penny Foust in "Reigh Site Report—Number 3" in Ritzenthaler, 1957: 292), most do indeed appear to be. And most show the raised lines noted by Highsmith. Wittry has noted that "Characteristically, a coating of copper salts which covers the surfaces of the specimens [of Old Copper Complex artifacts] has been one of the chief reasons for attributing to them a relatively great age, though soil conditions, particularly its chemical nature, will cause variations in degree and kind of patination. The exceedingly pure native copper of the Lake Superior region was used, being obtained by open pit mining on the Keweenaw Peninsula (Upper Michigan) or Isle Royale (Lake Superior). Nuggets of copper transported south from the area by glaciers were also used. Methods of manufacture included the ham-

mering of both hot and cold pieces, but in either case repeated annealing was necessary because copper becomes hard and brittle when hammered. It cannot be tempered." (See Wittry, 1951: 1-2; 1957: 204-205.)

Interestingly, in the Spring 1988 issue of the *Ohio Archaeologist*, a 3 1/2 inch long rat-tailed spear, found near Portsmouth in Scioto County, Ohio, was featured in the article by Thomas H. Miller entitled "Ohio Copper Blade and Gorget." (See Figure 7.) The heavy patination and hair-line ridges described by Highsmith as characteristic of artifacts of the Old Copper Complex appear in this instance to be features of this particular spear.

Conclusion? Absent the traces of silver evident in surface hair-line ridges, the two rat-tailed spears in the Heritage Hall Museum may well be Luristan rather than Old Copper Complex in origin. As Warren L. Wittry has observed: "For three-quarters of a century... copper specimens have been collected and have caused much discussion and controversy... To the archaeologist, whose tasks include the definition of prehistoric cultures and their proper placement in time and space, the Old Copper Complex still presents an interesting challenge." (1951: 1; 1957: 204.)

Acknowledgements

To Gale V. Highsmith goes my appreciation for his helpfulness in illuminating distinctions between the rat-tailed spears of the Old Copper Complex and those of other early cultures and for his kind permission to reproduce the illustration of the two Luristan points from his book on *Fluted Axes*. To Neil Allen and Kristina Kovalik of the Heritage Hall Museum goes thanks for making readily available the museum's diverse archaeological holdings. And, finally, gratitude is again in order to the Audio Visual Service of Miami University for assistance with several of the illustrations used in this article.

References

- Foust, Penny
1957 "Report." In "Reigh Site Report—Number 3." *Wisconsin Archaeologist*, 38(4): 292, 295.
Griffin, James B., Editor
1952 *Archaeology of the Eastern United States*, University of Chicago Press, Chicago. Figs. 37, 38.
Highsmith, Gale V.
1985 *The Fluted Axe*. Privately published. Milwaukee, Wisconsin.

- 1987 Personal correspondence with the author, October 29, November 16.
 1988 Telephone conversation with the author, August 16.
 Martin, Paul S. and George J. Quimby, Donald Collier
 1947 *Indians Before Columbus*. University of Chicago Press, Chicago: 299-303.
 McKern, W. C.
 1942 "The First Settlers of Wisconsin." *Wisconsin Magazine of History*, 16 (2): 153-169.
 Miller, Thomas H.
 1988 "Ohio Copper Blade and Gorget." *Ohio Archaeologist*, 38(2): 7.
 Ritzenthaler, Robert E.
 1946 "The Osceola Site—An 'Old Copper' Site Near Potosi, Wisconsin." *Wisconsin Anthropologist*, 27(3): 53-70. Reprinted in 38(4): 185-329.
 1952 "The Oconto Site—An Old Copper Manifestation." *Wisconsin Archaeologist*, 33(4): 199-223. Reprinted in 38(4): 222-244.
 1957 "The Old Copper Culture of Wisconsin." *Wisconsin Archaeologist*, 38(4): 185-329.
 Shriver, Phillip R.
 1987 "Old Copper Culture Rat-Tailed Spears From the Upper Peninsula." *Ohio Archaeologist*, 37(3): 26-27.
 Squier, Ephraim G. and Edwin H. Davis
 1848 *Ancient Monuments of the Mississippi Valley*. Smithsonian Institution, Washington: 201.
 Wittry, Warren L.
 1951 "A Preliminary Study of the Old Copper Complex." *Wisconsin Archaeologist*, 32(1): 1-18. Reprinted in 38(4): 204-221.
 Wittry, Warren L. and Robert E. Ritzenthaler
 1957 "The Old Copper Complex: An Archaic Manifestation in Wisconsin." *Wisconsin Archaeologist*, 38(4): 311-329. Reprinted from *American Antiquity*, January, 1956.



Fig. 1 (Shriver) Classic shape of an Old Copper Complex rat-tailed spear, an ovate blade with central ridge and cylindrical stem, classified by Warren L. Wittry as type I-C in his 1951 study. Adapted from a reprint of his article in *The Wisconsin Archaeologist*, 38(4): 214 (December, 1957).



Fig. 2 (Shriver) A variant of a socketed spear, defined by Wittry as type I-J in his 1951 study. Adapted from a reprint of his article in *The Wisconsin Archaeologist*, 38(4): 214 (December, 1957).

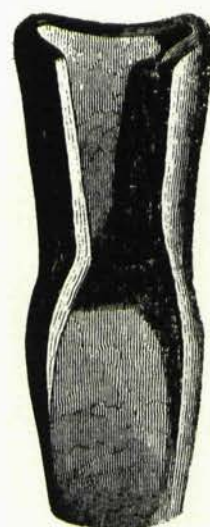


Fig. 3 (Shriver) Socketed "spud" of copper, probably used as an axe when hafted onto an elk antler handle. Reproduced here from page 201 of Squier and Davis, *Ancient Monuments of the Mississippi Valley*, the original was unearthed in Canada during the excavation of the St. Lawrence Canal. Similar axes have been found in Old Copper Complex sites in Wisconsin, as have elk antler handles.



Fig. 4 (Shriver) Rat-tailed spear from the William M. Jacka Collection, Heritage Hall Museum, Lakeside, Ohio. Reproduced here from the *Ohio Archaeologist*, 37(3): 27. Though having external similarities to Old Copper Complex projectile points (particularly that classified by Wittry as type I-C), it probably is a Luristan point of bronze, circa 3500 B.C. (See Figures 1 and 6.)



Fig. 5 (Shriver) Socketed spear point admitting a squared-off rat-tailed insert. Once thought to be Old Copper Complex in origin, it more likely may be Luristan. Reproduced here from the *Ohio Archaeologist*, 37(3): 27.

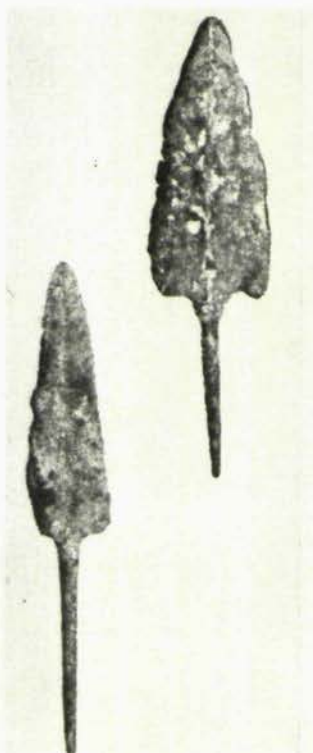


Fig. 6 (Shriver) Two bronze rat-tailed blades from Luristan. Reproduced here from page 509 of Gale V. Highsmith, *The Fluted Axe*, courtesy of the author/publisher.



Fig. 7 (Shriver) A copper rat-tailed blade found in Portsmouth in Scioto County, Ohio. Reproduced here from the article by Thomas H. Miller in the *Ohio Archaeologist*, 38(2): 7.

A Hopewell Pipe From the Tremper Mound

By Robert N. Converse
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Fig. 1 (Converse) Hopewell monitor pipe from the Tremper mound in the Wertz collection.

The Tremper mound is on the west bank of the Scioto River five miles north of Portsmouth, Ohio, in Scioto County. It was excavated in the summer of 1915 by William C. Mills of the Ohio Historical and Archaeological Society. Measuring approximately 250 feet long and 8½ feet high at its highest point, it was considered an effigy mound because of its convoluted outline. This irregular design proved not to be an effigy since the builders had simply covered a house pattern which in itself was not symmetrical. Surrounding this unusual mound was an enclosure which was

roughly square with rounded corners.

Among the more remarkable features of this Hopewell mound were two caches of pipes—one of 136 and one of 9—making a total of 145 pipes. Approximately eighty of these pipes were animal effigies—this being the only cache of such pipes except the Mound City discovery of a similar group by Squier and Davis in 1847.

A few of the Tremper pipes were tubular—with one modified tubular specimen—and one group were platform monitor pipes with exceptionally tall bowls. These tall-bowled pipes were

made of a dark red stone erroneously identified as Ohio Pipestone by Mills. In reality, they are made of imported catlinite from the Minnesota pipestone quarries.

The balance of the Tremper pipes are classic Hopewell monitor examples, all made of Ohio pipestone, quarried from the deposits not far from the mound. Shown in the color plate is a monitor pipe of red Ohio pipestone in the William Wertz collection, Portsmouth, Ohio. It was given to Wertz's father by the Tremper family many years ago.

An Historic Horizon Marker In A Small Ohio Stream Valley

By

Karl W. Kibler

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Knowledge of artifact context and depositional environments are of the utmost importance for the field archaeologist. Geological processes have an important impact on sites and artifacts from the time that they are abandoned until they are recovered by the archaeologist.

"Unless archaeologists and cultural resource managers take into account the natural and/or man-induced events and processes which may have affected the history of a region under study, their prediction and detection of sites and their description, analysis, and interpretation of those that have been discovered may be hampered seriously" (Turnbaugh 1978:593).

Horizon markers, such as Mt. Mazama ash in the Northwest United States, are important markers for building regional chronologies of human occupation, both relatively and absolutely.

A recent survey conducted by the Bureau of Environmental Services, Division of the Ohio Department of Transportation, in a small stream valley in Athens County, Ohio has produced a useful horizon marker for similar valleys of the unglaciated portion of the Appalachian Plateau. This horizon marker is a historical deposit marking the period of the first permanent white settlements in the immediate drainage basin. Clear-cutting by Euro-Americans of the slopes and uplands in these drainage basins produced a relatively thick fluvial deposit of gravel and small pebble size shales and limestones in the valley's stream channel and floodplain. Therefore depending on the date of settlement and clear-cutting this horizon marker separates the prehistoric and proto-historic site locations from the historic.

Athens County was formed in 1805, and by 1880 boasted a population of 28,411. By 1885 76% of the county had been cleared of its natural vegetation and was under cultivation, grazing, and other activities (Howe 1888:282). In an 80 year period, probably less, over 2 feet of alluvium was deposited in some floodplains from the slopes and uplands.

The valley surveyed is a small tributary of Sunday Creek in the southern half of section 4 in Trimble township in Athens County, Ohio. The valley is approximately 4000 feet long, running east to west, with the floodplain measuring 2175 feet in width at its junction with the Sunday Creek floodplain. The floodplain lies approximately 60 feet below the southern and northern uplands.

Testing was done on a narrow portion of the floodplain, (Fig. 1), measuring 100 feet across and approximately 2500 feet into the valley itself. Two foot by two foot test units were placed at 25 foot intervals across the floodplain (south to north). Unit number 1 (Fig. 2), was placed 15 feet north of the present stream channel, which runs along the extreme southern portion of the floodplain. Unit 1 yielded a poorly developed or leached solum (A and B horizons) of a dark brown silty clay loam. The top 8 inches was plow zone (Ap) with a diffused boundary above a 7 inch B horizon. The B horizon consisted of weakly developed granular peds. Below the Ap and B horizons is a fluvial deposit of gravel and small pebble size shales and limestones in a sand and clay matrix. The deposit is graded with the smaller gravel size shales and limestones occurring above the small pebble size. This is the historic fluvial deposit, which was 13 inches in depth. It overlies a truncated B horizon, 28 inches down, truncated meaning that the original overlying A horizon has been eroded and a strata of new sediments deposited over the remaining B horizon (Limbre 1975:236). This paleosol is a mottled and gleyed clay, yellow-brown and gray in color. A clear and smooth boundary marks the historic fluvial deposit from the prehistoric B paleosol.

Test unit number 2 (Fig. 3), was placed 25 feet north of the first test unit. It yielded 10 inches of plow zone (Ap). Consisting of a dark brown silty clay loam it gradually diffused to a B horizon 7 inches in depth. The B horizon consisted of a brown clay loam, with weak granular ped development. Underlying the B horizon was a fluvial deposit 5 inches in depth. This deposit consisted of shale and limestone gravels in a clay and sand matrix. The fluvial deposit overlies a truncated B horizon of mottled and gleyed clay, yellow-brown and gray in color.

Test unit number 3 (Fig. 4) was placed 25 feet north of test unit number 2, 50 feet north of test unit 1. Test unit 3 yielded a better developed solum, than units 1 and 2 inferring a longer period of stability and leaching which is inferred from the absence of an underlying fluvial deposit. Unit 3 consisted of an A horizon 11 inches in depth made of a brown silty clay loam. A clear boundary separates the A horizon from the underlying B horizon. The B horizon consisted of a yellow-brown clay loam with moderately developed blocky peds.

When all 3 units are examined in context there can be seen a lateral

grading of the fluvial deposit from large pebble and cobble shales and limestones in the present stream channel to small pebbles and gravels in unit 1 to gravels in unit 2 to an absence of the deposit in unit 3. This grading is south to north, so the material was not eroded from the northern slopes of the valley. Either the southern slopes were cleared of vegetation or the material was eroded from clear-cut areas upstream in the drainage basin, with the later being the most likely scenario, because of the narrowness of the floodplain in the test area. This would act as a bottle neck lowering the stream's velocity and in turn depositing its load.

Over time sediments become stable, i.e. they aren't eroded, and become weathered. Soil horizons develop and peds form through the leaching of clays out of the A horizon (Limbre 1975:4). With no good differentiation of soil horizons and weak ped development above the fluvial deposits in units 1 and 2 one can infer a young soil. These A and B horizons have been developing since the historic deposition of the underlying gravels and small pebbles. Time however, is not the only factor involved in soil development (Limbre 1975:2), but all artifacts encountered in the A and B horizons were historical. A scattering of prehistoric artifacts, lithic debitage and projectile points were recovered near the valley's mouth possibly redeposited from the truncated B horizon upstream and its original overlying A horizon.

This horizon marker is probably absent and/or a fruitless indicator in larger valleys such as the Hocking, or even Sunday Creek. However it can be an important inference in the smaller tributaries and narrow valleys of the unglaciated portion of the Appalachian Plateau.

Historical references of permanent white settlement and land use patterns must be determined for the area of testing or survey. Hopefully this horizon marker can prove to be a good predictable model for the location of aboriginal sites in small stream valleys of the unglaciated portion of the Appalachian Plateau.

Acknowledgements

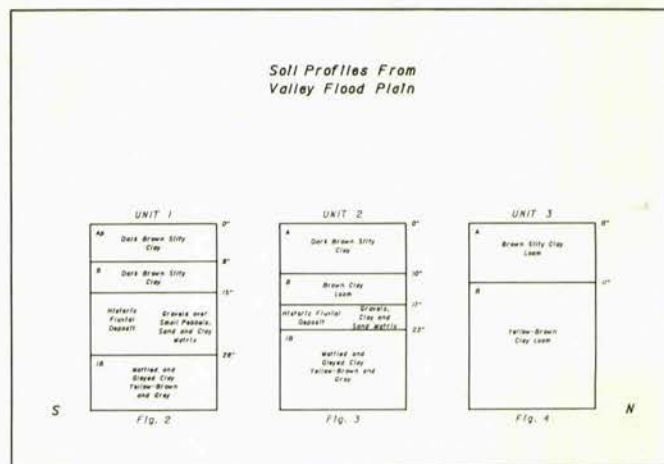
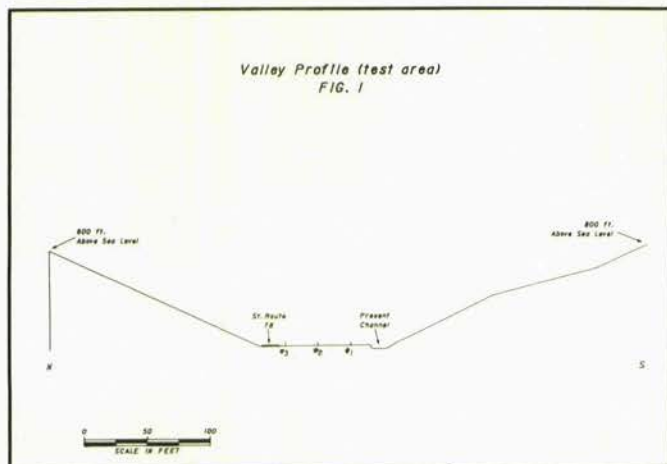
Stan Baker and Harry Murphy for their help and suggestions.

References

- Howe, Henry
1888 *Historical Collections of Ohio: An Encyclopedia of the State Vol. 1*
Published by the State of Ohio, C.J. Krehbiel and Co., Printers and Binders, Cincinnati, Ohio.

Limbrey, Susan
1975 *Soil Science and Archaeology* Academic Press, London.

Turnbaugh, William A.
1978 "Floods and Archaeology" *American Antiquity* 43:593-607.



A Pennsylvania Cache

By
John Eicholtz
Rd. 1, Box 251, Ellwood City, PA

This cache of Adena blades was found by Mrs. Iva Price on her farm in western Lawrence County, Pennsylvania, around 1910. I first saw them in the 1940's when she showed me exactly where she found them. I searched the area but found no other artifacts.

These are classic Adena cache blades and are very thin and well chipped. The largest blade is seven inches long and they are all made of Flint Ridge flint and are yellow, red, cream and blue in color.

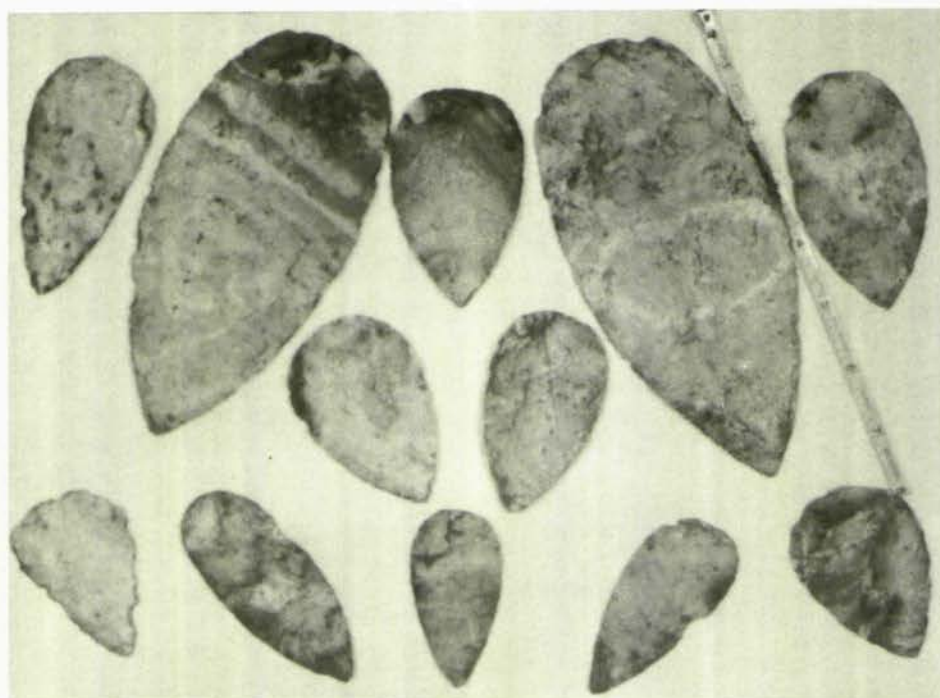


Fig. 1 (Eicholtz) *Adena* cache from Lawrence County, Pennsylvania.

Eccentrics

By

Robert N. Converse

199 Converse Drive, Plain City, Ohio 43064

Eccentrics have always been viewed with a suspicious eye by archaeologists, and rightfully so. The deluge of eccentric flint pieces made by the flint fakers nearly a century ago took in many prominent archaeologists as well as collectors. In the past half century the so-called "Texas spears" with their wild designs, shapes and multiple sets of notches have also fooled unknowing beginners. All these examples of the flint faker's work have caused nearly everyone to reject every eccentric out of hand.

However, there are eccentric flints

which are genuine, but they are as scarce as the fakes are abundant.

True eccentrics share a number of traits. They are never large, most of them being less than 2½ inches in length. Many of them are somewhat crude although there are a minor number of better made pieces. Most of them are fairly thick in cross-section and a good many of them show signs of heavy wear or use. They do not appear to have been made from broken points but their crudity may mask their origin.

There is no certain cultural affiliation. The only clue to their association may

be the fact that many of them are heavily ground, and basal grinding is an Archaic trait. At least one was found in a trash heap in a Licking County Hopewell site (Jim Hahn—personal communication). It is shown in Fig. 1—left.

The second point was found by Katrina Davis, daughter of ASO Vice President, Gary Davis, near Slate Mills in Ross County. It is made of Flint Ridge striped flint and is 1¼ inches long. Point three is from the Gary Davis collection, also from Ross County, and is of Indiana hornstone. Point four is from Hancock County.

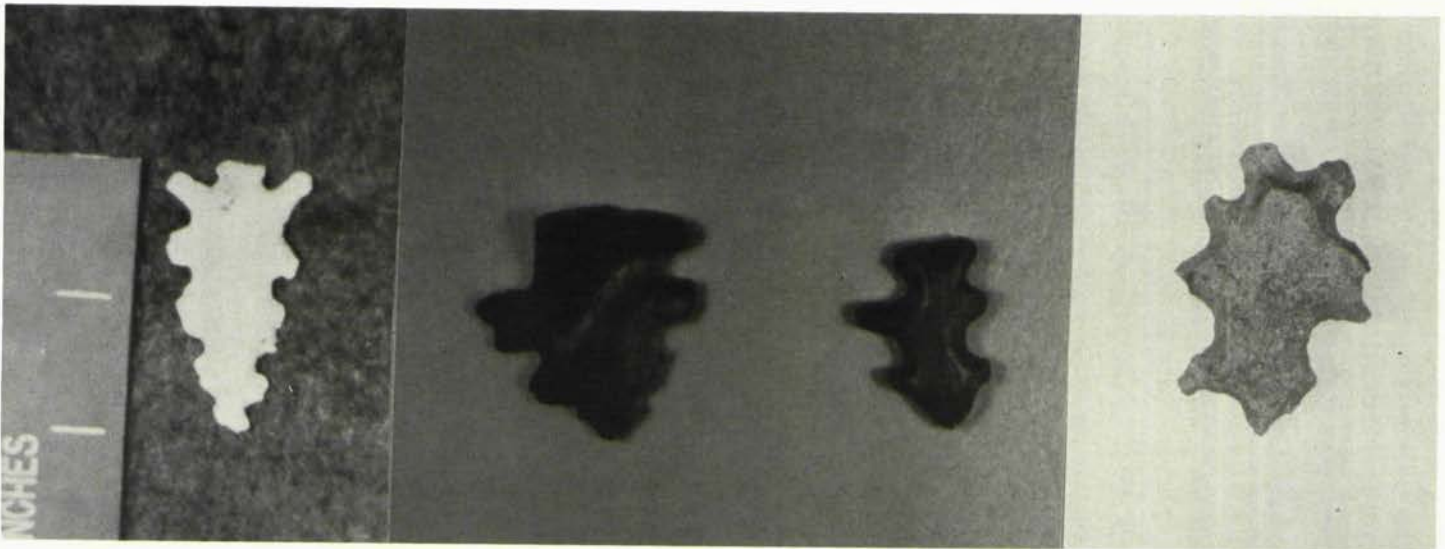


Fig. 1 (Converse) Eccentric flints. Licking County, Ross County, Hancock County.

A Warsaw Area Find

By

John Eicholtz

Rd. 1, Box 251, Ellwood City, PA

The point in Fig. 1 was found near Warsaw, Ohio, in June, 1988, by Mrs. Sally Bingle of Rt. 1, Ellwood City, Pa. It is a dovetail made of local Coshocton flint and is 3 inches long.

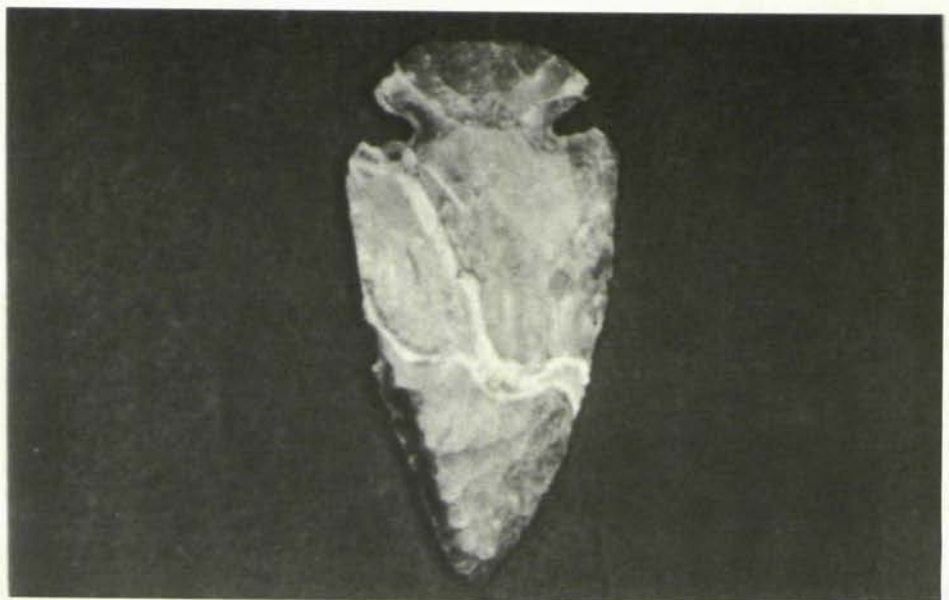


Fig. 1 (Eicholtz) Dovetail from the Warsaw area.

A Shovel Shaped Pendant

By
James O. Towarnicky
30 Tarry Towne, Washington, WV

The shovel shaped pendant shown in Fig. 1 was found on the Vincent site in Waterford Twp., Washington County, Ohio, by Lawrence Gossett of Beverly, Ohio. The site is now gone, a woodchip factory having been built over it.

The pendant differs from most such pieces in that it has two holes rather than the normal one hole.

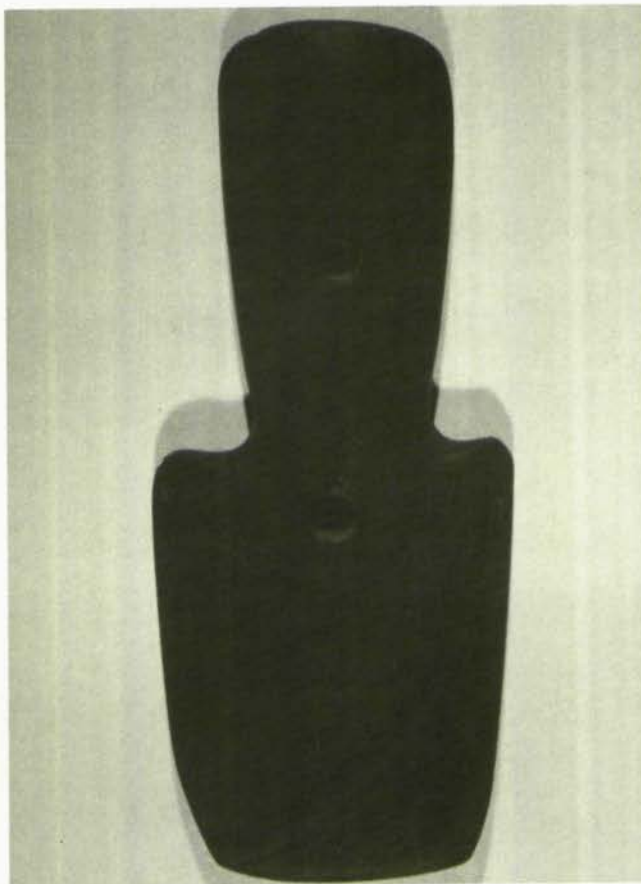


Fig. 1 (Towarnicky) Shovel shaped pendant from Washington County, Ohio.

A Bonanza of a Find

By
Judith Storti
New Castle, Pennsylvania

While vacationing in Coshocton County, Ohio, in April of 1987, I found what at first appeared to be a broken axe. However, my husband examined

it and it turned out to be a full grooved adze.

After a half hour of hunting in an ad-

joining field, I found a seven inch granite celt. That was the best day of hunting I had in 1987.



Fig. 1 (Storti) Full grooved adze from Coshocton County, made of banded slate.



Fig. 2 (Storti) Seven inch green granite celt from Coshocton County.

Three Surface Finds In Northern Summit County

By
Keith Simek

9302 Olde 8 Road, Northfield, Ohio 44067

While walking through a wooded area on plateau high above a stream in the spring of 1981, I was crossing a gas line used by dirt bike riders, and chanced to glance down, and there on the surface was approximately forty percent of a double crescent bannerstone. It is made of green banded slate and is broken just below where it had been drilled. I was amazed that even such a large portion remained intact, considering the use of the surrounding terrain.

Returning a week later, I found the small triangle at the base of a large oak tree in the woods about fifty feet from the gas line. Being rather pleased with this find, I began scraping away the previous fall's accumulation of leaves and not ten feet away I found the fine notched pendant. It is $3\frac{1}{2}$ inches in length, fashioned also from green slate.

I returned to the area several times thereafter and found nothing more. However in a very short time I'd discovered three very dissimilar artifacts from a period of time that very possibly spanned 3 to 4,000 years.



Fig. 1 (Simek) Half of a double crescent bannerstone, grooved pendant and triangular point from Summit County, Ohio.

Archaic Finds In Medina County

By
Keith Simek

9302 Olde 8 Road, Northfield, Ohio 44067

For the past three years I have hunted a vast cornfield in the township of River Styx, in Medina County.

After securing permission, I initially attempted to hunt the area in its entirety, consequently spending many hours searching in vain; not a flint chip to be

found. However, upon returning to my truck I located a spring on the opposite side of the road which fed, via a culvert beneath the roadway, into a rather deep streamlet, segmenting a small rise from the remainder of the field. The archaic pieces pictured below are all products

of that little rise, perhaps two acres in size. This proves once again that early mankind very often sought for habitation areas away from possible inundation, while locating themselves as near a source of water as possible.

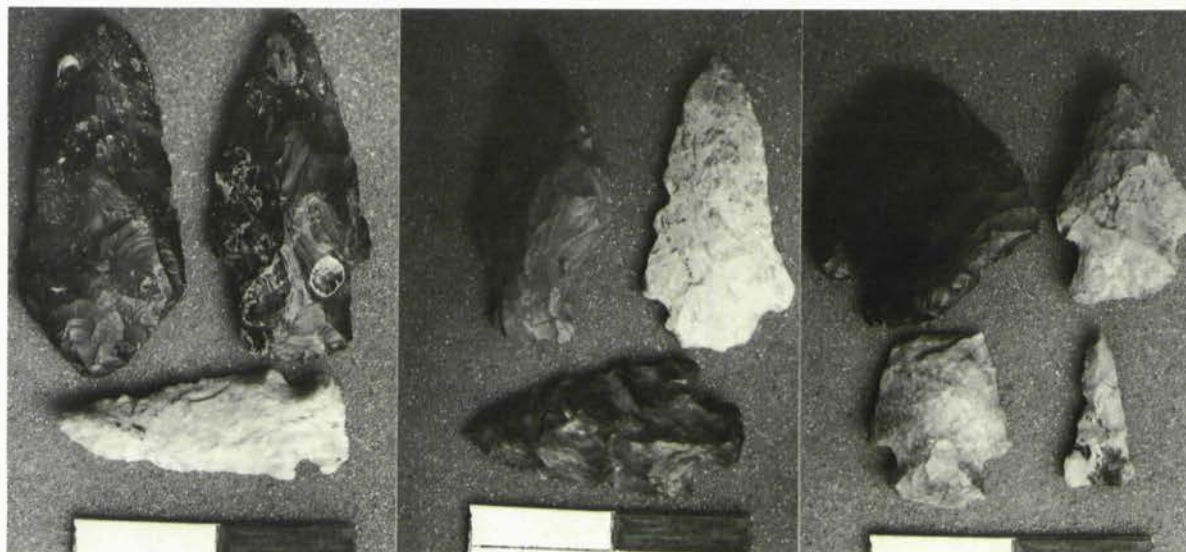


Fig. 1 (Simek) Archaic points from Summit County, Ohio.

Four Unfinished Pieces

By
James Matthews
10718 Tattenham Lane, Louisville, KY 40243

We all begin tasks we never complete for one reason or another, and so it was with prehistoric man. What prompted the incompleteness of many artifacts found on village sites may never be known. Often, the unfinished artifact is more interesting than a finished one since it shows the method of manufacture and sometimes problems encountered.

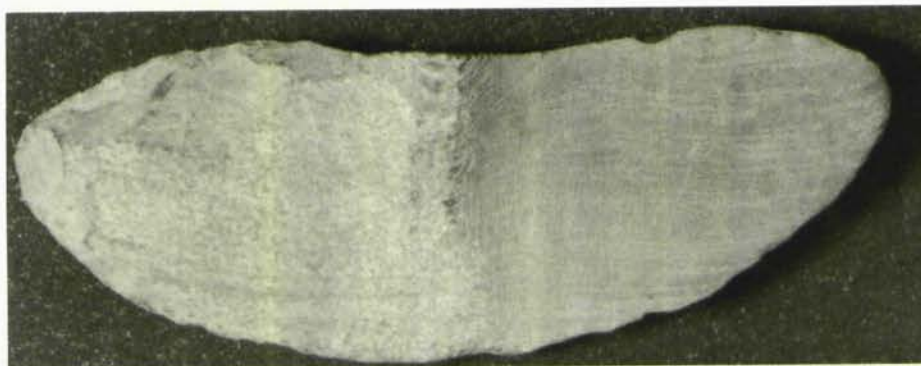


Fig. 1 (Matthews) Unfinished bannerstone, approximately 7 inches long made of blue banded slate. It shows the usual pecking on one half of the obverse and reverse and grinding on the other halves. There is no evidence of drilling. Found in Richland County, Ohio.



Fig. 2 (Matthews) Unfinished bannerstone about 5 1/2 inches long made of banded slate. The reverse shows heavy percussion and grinding while the obverse shows grinding and a little pecking near the tip. Note the rectangular ridge which would have permitted drilling which was not started. Found in Portage county, Ohio.



Fig. 3 (Matthews) Bannerstone about 5 1/2 inches long. Made of reddish/blue slate. Both faces are well ground and the platform areas for drilling are evident and are pecked but unground. There is no drilling. Found in Licking County, Ohio.

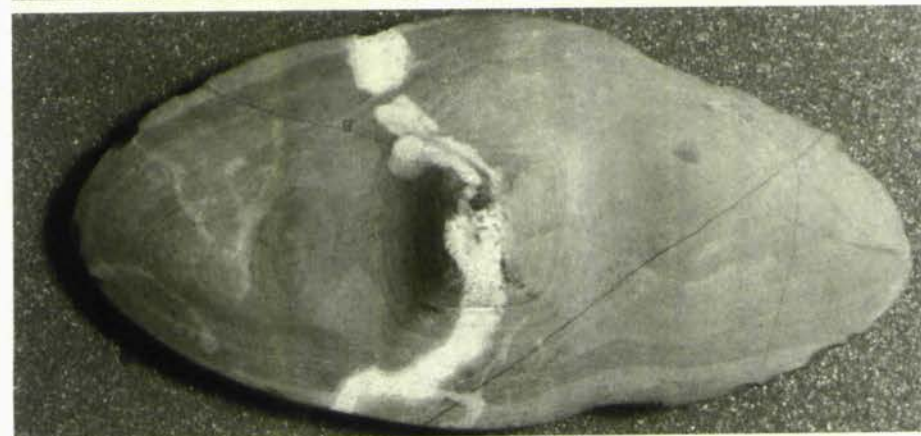


Fig. 4 (Matthews) Bannerstone 5 3/4 inches long from Union County, Ohio. Made of blue banded slate with four fault lines and a creamy white inclusion. It is completely polished on both faces including the center ridges but it is undrilled.

A Richland County Site

By
Dave Barr
RD 7, Stafford Dr., Mansfield, Ohio 44904

The artifacts in Figs. 1 thru 3 were found on one site in Richland County, Ohio, in the past four years. The site is very productive and rarely have I left it empty handed. The material from this location won best site award at the Johnny Appleseed chapter of Mansfield.



Fig. 1 (Barr) Axe, celt, broken pendant and gorget.

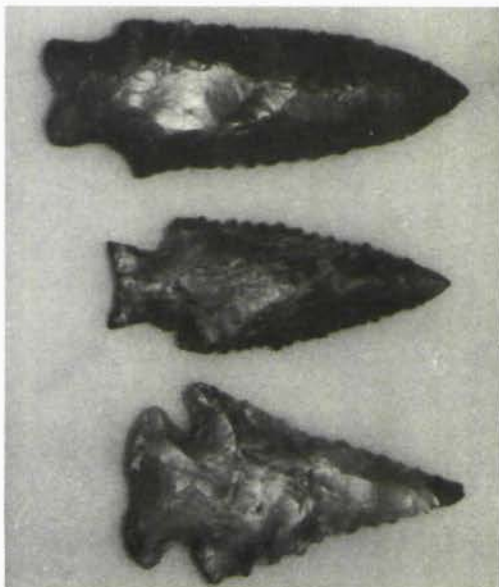


Fig. 2 (Barr) Archaic bevel, serrated point and heavy duty point.

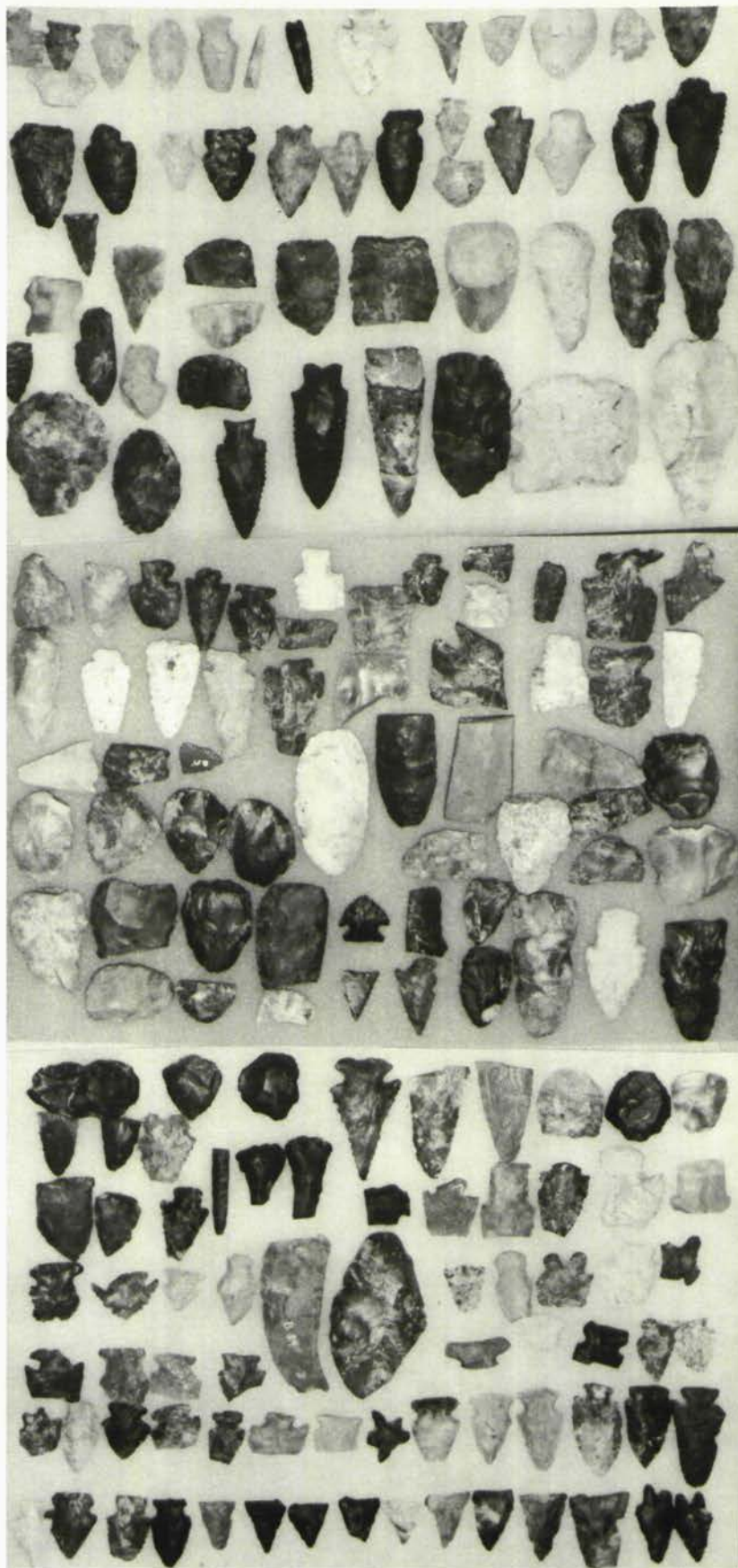


Fig. 3 (Barr) Other artifacts from site.

Two Fine Pipes

By
Ron Ammerman
New Castle, Indiana 47362

Shown in Figs. 1 and 2 are two pipes from my collection. The first is an intrusive mound pipe made of black steatite. It was found in Jefferson County, Ohio, and displays the typical ridge above the stem hole on the rear platform. A series of tally-marks circle the

top of the bowl.

The second pipe is from Obion County, Tennessee, and is also made of black steatite. It is extremely interesting in that both the upper part of the platform and the bottom are decorated

with incised patterns. The three-pronged design is often interpreted as a weeping eye motif while the larger design may be a mace or spud. Both such motifs are often found in southern cult artifacts.



Fig. 1 (Ammerman) Intrusive mound pipe from Jefferson County, Ohio.



Fig. 2 (Ammerman) Steatite pipe from Tennessee showing both top and bottom.

Two Northern Ohio Pieces

By
Andrew Wilgor
4335 Brockley Avenue, Sheffield Lake, Ohio 44054

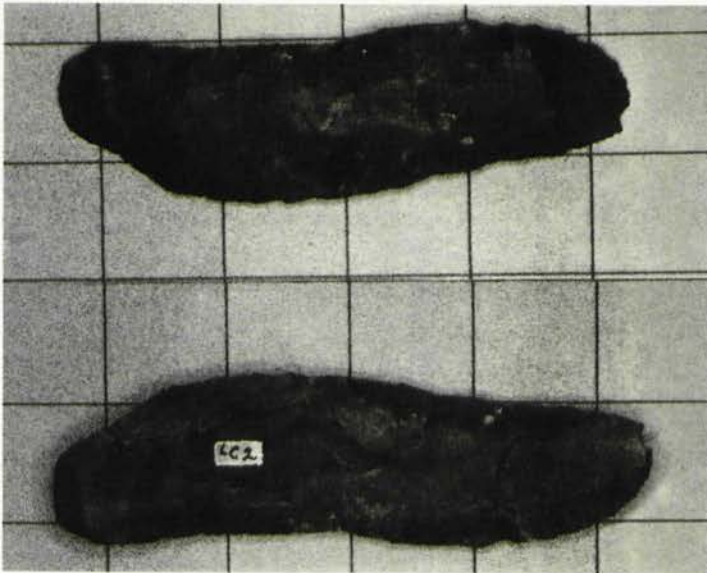


Fig. 1 (Wilgor) Paleo knife 4 $\frac{3}{8}$ inches long, is made on a uniface blade of Coshocton Flint. At it's widest point it is 1 $\frac{1}{4}$ inches and $\frac{3}{8}$ of an inch at the thickest point. It is pressure flaked almost completely around it's edges. The striking platform at the top is the only place not resharpener. Found February, 1988, in Lorain County, Ohio. It won best of show at the March 1988 meeting of the O.A.S. for Flint Tools. Obverse and reverse shown.

These two pieces were personal finds, the knife in Lorain County and the human effigy in the Sandusky Bay area.

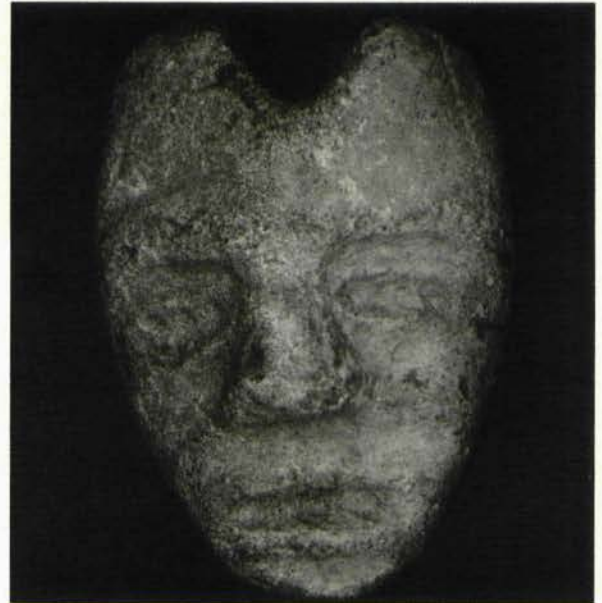


Fig. 2 (Wilgor) Human effigy made of a high quality ceramic and shows much skill in workmanship. It is 1 $\frac{1}{2}$ inches long and 1 inch wide. Found in the spring of 1986 at the Sandusky Bay area.

Three Points From the Roberts Collection

By
Dale and Betty Roberts
Mt. Sterling, Iowa

Fig. 1 (Roberts) Shown are three points, all of Flint Ridge material, in our collection. Left is a dovetail from Franklin County, Ohio. Center is a basal notched point of Flint Ridge chalcedony 5 $\frac{9}{16}$ inches long from Medina County, Ohio. Right is a dovetail from Darke County, Ohio 4 $\frac{1}{16}$ inches long.



Central Ohio Artifacts

By
Steve Carpenter
Plain City, Ohio

Because of the no-till farming methods used today, the finding of Indian artifacts is slowly becoming very difficult. While collectors of thirty years ago might find large numbers of artifacts, today's collector is fortunate to recover even one good piece in a day of hunting.

But this shouldn't deter collectors from hunting because, as may be seen in the accompanying picture, there are still some good pieces still to be found. All were found in the spring of 1988 in Union, Madison and Franklin counties.



Fig. 1 (Carpenter) Artifacts from the plano to Fort Ancient period. Delaware chert, Coshocton flint and Flint Ridge flint was used. Illustrated are: archaic stemmed points bifurcates archaic side notch, Woodland points, triangles, Stringtown point and various other artifacts.

Boyhood Finds

By
Jeff Zemrock
Rt. 1, Perrysville, Ohio

I began hunting artifacts when I was a young boy as the result of visits with a neighbor, the late Ralph W. Sherrick whose interest started my own and on whose farm I began hunting.

One particular place on his farm proved to be the most productive since I found small points which I called "swallowtails." They were always in an area about 50 yards in diameter, none occurring elsewhere. That was twenty years ago but I now realize that these are bifurcated points.

Also shown in Fig. 1 are a variety of other artifacts from the site—a slate roller pestle, a small adze, birdpoints, an archaic bevel, and a diagonal corner notched point which appears to have been broken and re-chipped by the Indian.

These pieces are from Wooster Twp., Wayne Co., Ohio, and the area seems to have had a large population in archaic times since beveled, bifurcated and side notched points are the most common.



Fig. 1 (Zemrock) Artifacts from the Sherrick farm.

An Erie County Fluted Point

By George DeMuth
4303 Nash Rd.
Wakeman, Ohio 44889

I have been a member of the ASO since 1968, and over the years my wife, Cheryl and I have found a number of artifacts. But, like many good finds, some are made unintentionally.

One such find was made in July of 1972 on a farm we had just purchased in Florence Twp., Erie, County, Ohio. We were combining wheat and during harvest my wife was hauling grain to the local elevator. On one of her trips she got the truck stuck in a drainage ditch for which I scolded her and asked her to walk back to the barn to get a tractor. She was also upset and on her way back she walked through a corn field instead of using the farm lane. On a rise overlooking a swampy area she found the fluted point shown in Fig. 1. It is red Flint Ridge material and is translucent.

When she arrived back with the tractor, and before I could scold her again, she opened her hand and showed me the point. I could see from the combine that it was a fine fluted point and the mired down truck was forgotten. It is to this day the most outstanding piece in our collection.



Fig. 1 (DeMuth) Obverse and reverse of Flint Ridge fluted point from Erie County, Ohio.

The Muster Axe

By David Farrow
235 2nd SW,
New Philadelphia, Ohio 44663

Shown are the obverse and reverse of a dark hardstone axe from the collection of Walter Muster of Dover, Ohio. It was purchased many years ago at a local auction. This axe is unique in that it has a deep groove cut parallel with the length of the axe which is in addition to the normal horizontal groove. The second groove is not accidental and it is obvious that it required a great deal of work and must have served a particular purpose for its oboriginal owner. It is possible that the secondary groove may have been an effort of the owner to better haft the axe head and may have been used to accommodate wedges or shims.

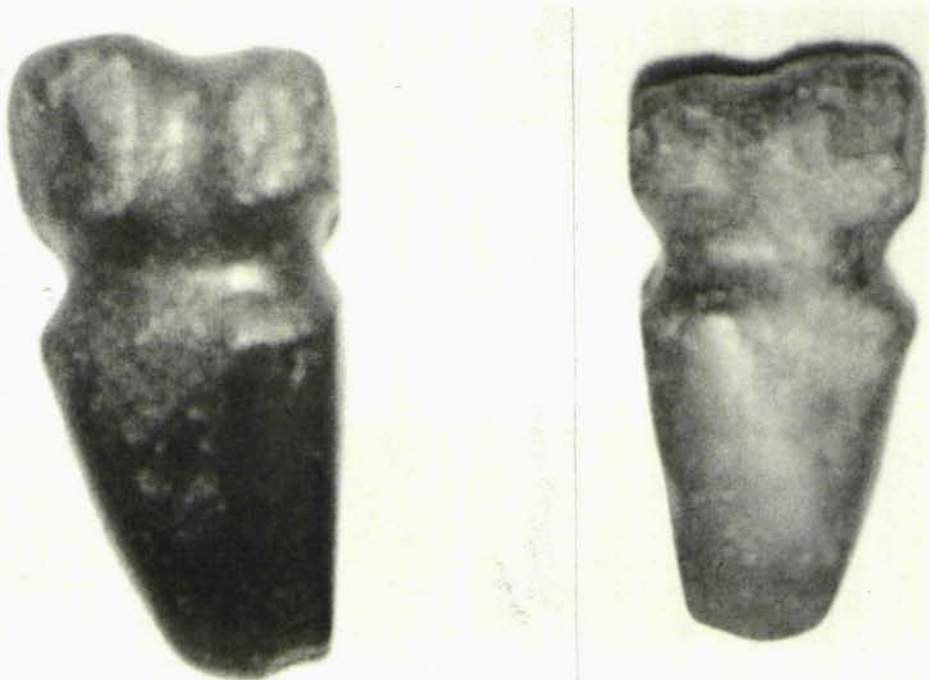


Fig. 1 (Farrow) Axe from Dover, Ohio. Note groove on poll.

A Large Hopewell Spear

By Robert N. Converse
199 Converse Drive,
Plain City, Ohio 43064



Fig. 1 (Converse) Hopewell spear of Knife River Flint from Calhoun County, Illinois.

There were two large centers of Hopewell activity in the eastern United States—one in the Scioto Valley in Ohio and the second in the Illinois River valley in Illinois. At both centers a great deal of imported material and artifacts were found. In fact the penchant for exotic materials was a Hopewell trait and some rather bizarre stone such as obsidian and novaculite has been recovered from Hopewell mounds. Even though local deposits of flint of high

quality were available in Illinois and Ohio, especially at Flint Ridge, Hopewell flint knappers fashioned spears and knives of flint obtained elsewhere. One imported flint found in both Ohio and Illinois Hopewell spears came from the Knife River deposits in North Dakota. This honey colored stone presents a beautiful amber color when light is passed through it, a characteristic which did not escape Hopewell craftsmen who had an eye for the unusual.

The spear shown in the color plate is in the collection of J. Clemans Caldwell of Danville, Kentucky. It is a classic Hopewell form and is highly reminiscent of Ohio obsidian examples. This epitome of the flint worker's art is 6 $\frac{3}{4}$ inches long and is at no point more than $\frac{1}{8}$ inch thick. It was excavated from the Snyders site, Mound C114, Burial No. 1, in Calhoun County, Illinois, by William Wadlow in 1940.

Three Birdstones From the Caldwell Collection



Fig. 1 (Caldwell) Shown are three birdstones of different styles. Top birdstone was found on the banks of the Grand River, Morgan Township, Ashtabula County, Ohio. It is made of gray Ohio pipestone which is an unusual material for birdstones.

Center was found in Isabella County, Michigan. It is made granite porphyry having yellow phenocrysts with biotite mica/hornblende crystals.

*Bottom was found in Alpena County, Michigan. It is fashioned from porphyry with yellow phenocrysts in a diorite groundmass. All birdstones are pictures in *Birdstones of the North American Indian* by Townsend on pages 608, 486, 488.*

Reference

- 1959 Townsend, Earle C. Jr. *Birdstones of the North American Indian*. Privately printed, Indianapolis.

Ancient Eclipse Paths At The Serpent Mound

By

William F. Romain

4000 Westbrook Drive, #502, Brooklyn, Ohio 44144

In earlier articles (Romain 1988a,b,c.) it was suggested that the Serpent Mound may depict an ancient solar eclipse. In support of this hypothesis, the present article will show that numerous solar eclipses were visible within the spatial and temporal parameters of the Serpent Mound builders—and that several of these eclipses were of sufficient magnitude or uniqueness to have inspired the building of the Serpent Mound effigy.

Unfortunately, correlating the building of the Serpent Mound with any one specific eclipse is made difficult by the fact that the date of the effigy's construction is unknown. Various references are available that provide accurate dates for the occurrence of all solar eclipses dating to at least 2000 B.C. However, as discussed elsewhere (Romain 1987:5-6), no radiocarbon dates have been obtained for the Serpent Mound effigy; nor have any artifacts been found in the earthwork which might reveal the cultural identity of its builders. If built by the Adena Indians, as is most often suggested, the effigy could date to anytime from 1000 B.C. to A.D. 100. If built by the Hopewell Indians, the effigy could date to anytime between about 200 B.C. and A.D. 500.

Research Strategy

In view of the above, the approach taken in this study was to first identify all solar eclipses that occurred between 1000 B.C. and A.D. 700. This was accomplished by review of the eclipse maps found in Mucke and Meeus' *Canon of Solar Eclipses -2003 to +2526*. (Henceforth all dates in this paper will be given in Julian calendar convention and will follow standard astronomical practice using positive or negative year numbers.)

In short, Mucke and Meeus' *Canon* includes an Introduction with equations for calculating the specific circumstances of any eclipse. This Introduction is followed by 600 pages of tabular data providing Besselian elements and other data relevant to every solar eclipse occurring between -2003 and +2526. The *Canon* then concludes with an additional 300 pages of computer-drawn maps showing the central path and/or limits of partiality for each eclipse listed in the tabular data (see Figure 1).

Review of Mucke and Meeus' eclipse maps showed that a total of 4,048 solar eclipses were visible from some point on the earth between the years -999 through +700. Of these 4,048 eclipses,

159 eclipses were found to have central paths that crossed the eastern North American continent between the latitude of Hudson Bay and the Florida peninsula. Depending upon the path width of each particular eclipse, all 159 eclipses would have been visible, to a greater or lesser extent, at the Serpent Mound and within the Ohio Adena-Hopewell core culture area. For the purposes of this study, the Ohio Adena-Hopewell core culture area was considered to extend roughly 250 miles in radius from the Serpent Mound.

Parenthetically, it should be noted that although Mucke and Meeus' *Canon* is the best reference currently available for this type of study, the maps found in the *Canon* are not entirely accurate. As Mucke and Meeus (1983:viii-ix) point out, their maps neglect the effects of the earth's rotation during an eclipse; and there are certain other, although less significant difficulties with their work (see Dunham 1984; Fiala 1985). As a result, sections of Mucke and Meeus' plotted eclipse paths can be in error by almost 250 miles (Dunham 1984:127). Still, the maps are sufficiently accurate to enable preliminary assessments, or first approximations of the eclipses visible in a given area. This is especially true when one considers that at a point as far away as 1,000 miles from the central line of a total or annular eclipse, as much as one-half of the sun's diameter is covered at maximum eclipse. On the other hand, the maximum lateral plotting error in Mucke and Meeus' eclipse maps is only 250 miles.

Anyway, the next step in this study was to calculate the local circumstances, as viewed from the Serpent Mound, of each of the above identified 159 eclipses. This was done using a commercially available computer software program called MOON AND SUN (Kluepfel 1984). MOON AND SUN is a precise, complex program designed to calculate the elements of either a solar or lunar eclipse—given a specific date and either user-inputted, or program-assigned value for delta-T. Using this data, the program then provides the user with such information as central line geographical coordinates and path width, as well as, duration, altitude, azimuth, magnitude, and other visibility information for the eclipse of interest and as viewed from any inputted geographical location. As already noted, the geographical coordinates utilized for this study were those of the Serpent Mound.

As far as the accuracy of Kluepfel's

program is concerned, the program's stated accuracy for solar positions close to the present time is 0.0001 degrees, while lunar positions are accurate to 0.0003 degrees. This makes the program extremely useful for studies of this type. In fact, as John Mosley of the Griffith Observatory has noted (Mosley 1986:279), the program's "phenomenal accuracy" makes it the best program of its kind currently available.

More to the point, however, the accuracy of Kluepfel's program was tested by comparing the results of his program to the results obtained by calculating the circumstances of a selected eclipse using Mucke and Meeus' formulae and data. The eclipse chosen for this comparison was the one that occurred on July 24, -866. Using Mucke and Meeus' formulae and data, the calculations took several hours using a hand calculator. Kluepfel's computer program, however, returned its data within a matter of minutes. And, as Table 1 shows, the final results were almost identical.

Yet another variable reviewed in connection with the above-noted 159 eclipses was the proximity of each eclipse to solstice and equinox events. This analysis was made in search of a possible relationship between the solar eclipse symbolism evidenced by the Serpent Mound and potential solstice and/or equinox alignments at the site (see Hardman and Hardman 1987). Regardless of whether or not such alignments can be shown to exist, it is certainly true that the occurrence of a solar eclipse at or near one of the solstices and/or equinoxes would have been a noteworthy event. Recall that at the solstices the sun appears to stop in its northerly or southerly movement; whereas at the equinoxes, the length of night and day are almost equal. For the annual path of the sun to be interfered with, or threatened by an eclipse at these critical times may have seemed especially dangerous. In any event, this particular analysis was accomplished by review of Stahlman and Gingerich's (1963) tabular data which provides the apparent geocentric longitudinal coordinates for the sun at 10-day intervals. Julian dates for relevant solstice and equinox events were then verified using Bretagnon and Simon's (1986a) computer program SUMER.BAS, which provides coordinate data for selected celestial bodies by date—with a stated accuracy in this instance to 0.0007 degrees (Bretagnon and Simon 1986b:7). Solstices were considered to occur on those Julian dates when the sun's geo-

centric longitude equalled 270 degrees or 90 degrees, while equinoxes were considered to occur on those Julian dates when the sun's geocentric longitude equalled 360 degrees or 180 degrees.

Results

What the above analyses revealed was that of the 159 eclipses under consideration, 3 eclipses would have appeared as total eclipses at the Serpent Mound and throughout much of the Ohio Adena-Hopewell core culture area (see Figures 1 & 2). Of course, the extent to which the entire core culture area would have experienced totality in each instance is dependent upon the path width of each eclipse.

Out of the 159 eclipses, it was also found that 2 eclipses would have appeared as annular eclipses at the site and in the surrounding area with an obscuration factor greater than 90%. Recall that in an annular eclipse a ring of sunlight remains visible around the silhouetted disk of the moon (see Figure 3).

Of the remaining 154 eclipses, 28 of these eclipses would have appeared as partial at the Serpent Mound, obscuring 90% or more of the sun's apparent area. Data relevant to the total, annular, and partial eclipses just mentioned is presented in Tables 2, 3, and 4; while definitions for the terms used in Tables 1, 2, 3, and 4 can be found in Note 1 at the end of this paper.

Of special interest, review of the data presented in Table 2 shows that of the three total eclipses visible at the Serpent Mound, the eclipse of June 25, -223 probably would have been the most spectacular of this group. This eclipse began at about 9:14AM (EST) and ended at approximately 12:09PM (EST), totality occurring at 10:37AM (EST), when the sun was high in the summer sky, at an altitude of almost 62 degrees. Further, this eclipse occurred one day before the summer solstice which in the year -223, took place on June 26.

The data in Table 3 is self-explanatory and requires no further comment. However, in connection with the data presented in Table 4, there are several eclipses in this group that are worthy of note. In particular, the eclipse of July 24, -866 is of interest due to its long duration of more than five minutes. Moreover, this eclipse occurred early in the afternoon, reaching its maximum magnitude at about 1:34PM (EST), when the sun was high in the summer sky, at an altitude of almost 69 degrees. Undoubtedly, this eclipse would have been quite a spectacular event. Similarly, the eclipse of July 15, -317 is of interest because of its long duration of more than five minutes. Moreover, this eclipse

reached its maximum at about 11:25AM (EST), when the sun was high in the summer sky, at an altitude of 68 degrees.

Referring again to Table 4, the eclipse of -171 is of interest in view of the fact that it occurred on the morning of the vernal equinox which in -171, occurred on March 24. And, this eclipse had a magnitude of 0.996. Similarly, the eclipse of March 21, 619 occurred close to the date of the vernal equinox which in 619, occurred on March 18. And, this eclipse had a magnitude of 0.983. In fact, the eclipses of -171 and 619 may actually have been seen as total eclipses at the Serpent Mound—given the uncertainties in the calculations involved in determining ancient eclipse paths.

Finally, two more eclipses noted in Table 4 are of special interest. The eclipse of March 21, 98 is worthy of note because it occurred one day before the vernal equinox which in the year 98, took place on March 22. And, the eclipse of July 27, 352 is of interest because maximum obscuration occurred early in the afternoon, at about 1:27PM (EST), when the sun was high in the summer sky, at an altitude of almost 68 degrees. Further, both of these eclipses exhibited a magnitude greater than 0.96 which would have resulted in a fairly significant darkening of the sky.

Accuracy

Over the years, there have been a number of studies made of the relationships between ancient solar eclipses and various types of archaeological evidence (e.g., Bracher 1982; Smiley 1975; Hawkins 1965). Whether using Oppolzer's (1962; orig. in 1887) data, Mucke and Meeus' (1983) formulae and data, or Kluepfel's (1984) computer programs, however, the most significant problem in terms of ascertaining the characteristics of any ancient eclipse continues to be the uncertainty associated with the variable known as delta-T.

Quite simply, delta-T is the difference between Ephemeris Time and Universal Time as measured in hours, minutes and seconds. (For the sake of brevity, use of the recently adopted Terrestrial Dynamic Time will not be considered here). As Mucke and Meeus (1983:ix) explain;

Ephemeris Time . . . is the uniform measure of time, determined in principle from the orbital motions of the planets, in particular that of the Earth. . . . Universal Time (UT), however, is defined by the rotational motion of the Earth, and is determined from the apparent diurnal motions which reflect this rotation; because of variations in the rate of the rotations, UT is not rigorously

uniform.

In addition to the steady lengthening of the day, the Earth manifests irregular variations in its rate of rotation. They are completely unexpected and unpredictable, and are attributed to the changes in the distribution of mass in the Earth's interior. Consequently, Universal Time is an irregular varying quantity. . . . For ancient years, the fluctuations due to the irregular rotation of the Earth are unknown, and only an approximate value of delta-T can be given.

In short, what this means is that since the calculations involved in determining the characteristics of all ancient eclipses require the input of delta-T, there will always be a degree of uncertainty associated with the results of such calculations—until accurate values for delta-T can be established. In the case of the tables presented in this paper, the value for delta-T inputted into Kluepfel's program for each eclipse of interest was derived by interpolation from Mucke and Meeus' (1983:xxviii) Table II, Delta-T Without Fluctuations. Eventually, better expressions for delta-T will be found—based on comparisons between ancient observations and improved theories of planetary dynamics. In the meantime, the data presented in this paper must be understood to be limited in terms of its accuracy as a result of the uncertainties surrounding delta-T.

Conclusion

Undoubtedly, for many prehistoric peoples, the occasion of a solar eclipse provided feelings of confusion and fear—just as happens today among many technologically less-advanced peoples. Whereas the rising and setting of the sun, day after day, and year after year inspires a sense of order and permanence, a solar eclipse upsets that predictable order of things—threatening to throw the world into chaos and permanent blackness.

During a total eclipse, birds and insects become unusually quiet, the temperature drops by several degrees, dew often settles over the landscape and suddenly, the world is engulfed in a strange and foreboding darkness as the life-giving sun disappears. No wonder Indians such as the Alsea might think that ". . . should the sun disappear, (and) should darkness prevail all over the world, all the people would simply die" (Frachtenberg 1920:229).

In any event, what is certain is that at least four eclipses had a direct impact on North American Indian history. It was the solar eclipse of 1451 that resulted in the Seneca Indians joining the League of Iroquois (Canfield 1902:36-39); and in 1504, it was a lunar eclipse predicted by Christopher Columbus that

resulted in his establishing relations with the Jamaican Indians (see Figure 4).

Similarly, the Shawnee prophet Tenskwatawa (see Figure 5) used his prediction of a solar eclipse in 1806 to establish his credibility as a prophet—thereby initiating a movement to return to the old ways (Mooney 1907-10); while in 1889, it was the Paiute prophet Wovoka, who, during a solar eclipse had a vision that resulted in the well-known Ghost-Dance movement (Mooney 1896:773-774).

Given the impact of these eclipses on Indian history, there is every reason to believe that a prehistoric eclipse witnessed by the Adena or Hopewell peoples could have resulted in the building of the Serpent Mound. Certainly, the astronomical evidence presented in this paper is supportive of that conclusion—especially in view of the fact that three total, two annular, and as many as twenty-six partial eclipses of significant magnitude may have been witnessed by these peoples.

Moreover, the interest by the effigy builders in celestial phenomena and in the sun in particular, is evidenced by their construction of the Serpent Mound in apparent alignment with the sun's meridian transit (Romain 1988a)—thus increasing the likelihood that they would have attached special significance to a phenomenon such as a solar eclipse.

Finally, there is little doubt that the building of the Serpent Mound required a tremendous amount of physical effort.

Its builders possessed only crude digging tools of bone, shell, and stone; and the amount of earth that could be moved was limited to what one could carry. Surely then, it must have been a deeply significant and no doubt, rather spectacular event that inspired the effigy's construction. In view of this, can it be any coincidence that "the most spectacular celestial phenomenon throughout all of the world's history was, is, and will always be an eclipse of the sun . . ." (Mitchell 1969:3-4; orig. in 1951)?

Notes

1. Magnitude is the fraction of the sun's diameter that is covered at the given time.

Obscuration is the fraction of the sun's apparent area that is covered at the given time. Unlike magnitude, this variable cannot exceed 100%.

Duration is the length of time, in minutes and seconds, of totality or annularity. In the case of Tables 2 and 3, duration is as experienced at the Serpent Mound. In the case of Tables 1 and 4, duration is as experienced at maximum eclipse on the central line.

Time of Max E refers to the time of maximum eclipse as viewed from the Serpent Mound. All times are given as Eastern Standard Time.

Path Width is in miles at the time of maximum eclipse.

Altitude refers to the elevation of the sun, in degrees, as seen from the Serpent Mound at maximum eclipse.

2. For the purposes of this comparison, the inputted value for delta-T in both instances was 349.0 minutes, as derived from Mucke and Meeus' (1983: xxviii) Table II, Delta-T Without Fluctuations.

Acknowledgements

I am grateful to Dr. Katherine Bracher, Professor of Astronomy at Whitman College, Walla Walla, Washington for her earlier efforts to identify the eclipses visible in the core area using Oppolzer's formulae and data. Although her results were not incorporated into this paper because of the subsequent availability of Mucke and Meeus' *Canon* and Kluepfel's computer programs, Kate's preliminary study greatly influenced the approach taken by my own work.

I would also like to thank Dr. Jay M. Pasachoff, Hopkins Observatory, Williams College, Williamstown, Massachusetts for permission to reproduce the photographs in Figures 2 and 3. And, special thanks are extended to Jean Meeus for his helpful comments regarding the plotting of ancient eclipse paths.

References

- Bracher, Katherine
1982 Solar Eclipse Tracks of Possible Archaeological Interest. *Archaeoastronomy* 5(3):24-25.
- Bretagnon, Pierre, and Jean-Louis Simon
1986a SUMER.BAS (Computer program). Willmann-Bell, Inc., Richmond, Virginia.
- 1986b *Planetary Programs and Tables from -4000 to +2800*. Willmann-Bell, Inc., Richmond, Virginia.

Table 1. Data Comparison Using Mucke and Meeus' Formulae and Data versus Kluepfel's Computer Program for July 24, -866 Eclipse (see Note 2)

	Begin Eclipse	Maximum Eclipse	End Eclipse	Mag.	Alt.	Duration (min:sec)
Mucke and Meeus' Formulae and Data	12:10PM	1:33PM	2:56PM	0.971	68.8	5:15
Kluepfel's Program	12:11PM	1:34PM	2:52PM	0.971	68.7	5:31

Table 2. Total Eclipses at the Serpent Mound

Julian Date	Mag.	Obscur.	Duration (min:sec)	Time Max E	Path Width	Alt.
-992 May 9	1.014	1.000	2:60	7:19AM	286	19.5
-223 Jun 25	1.006	1.000	1:27	10:37AM	38	61.7
138 Jan 28	1.008	1.000	1:37	7:57AM	85	0.6

Table 3. Annular Eclipses at the Serpent Mound

Julian Date	Mag.	Obscur.	Duration (min:sec)	Time Max E	Path Width	Alt.
-685 Oct 30	0.977	0.954	1:57	1:41PM	86	36.0
451 Oct 10	0.955	0.912	2:20	1:56PM	167	38.8

Table 4. Partial Eclipses of 90% or Greater Obscuration at the Serpent Mound

Julian Date	Mag.	Obscur.	Duration (min:sec)	Time Max E	Path Width	Alt.
-959 Dec 27	0.924	0.908	1:14	11:23AM	61	24.8
-942 Aug 23	0.945	0.903	4:54	1:23PM	117	63.6
-929 Jun 2	0.982	0.986	3:23	5:57AM	204	8.0
-866 Jul 24	0.971	0.976	5:31	1:34PM	154	68.7
-859 Mar 11	0.962	0.960	2:17	4:32PM	74	20.7
-746 Feb 20	0.926	0.918	3:47	11:32AM	202	34.3
-744 Jun 25	0.966	0.968	4:03	9:29AM	128	49.3
-631 Dec 1	0.941	0.905	3:08	4:27PM	141	7.6
-538 May 30	0.929	0.915	1:16	4:04PM	41	40.0
-528 Nov 2	0.917	0.905	2:57	12:35PM	118	37.4
-490 May 9	0.942	0.923	0:47	12:54PM	19	65.8
-383 Jan 28	0.978	0.981	3:46	11:54AM	174	30.1
-317 Jul 15	0.954	0.955	5:10	11:25AM	131	68.0
-291 Aug 25	0.930	0.924	4:06	9:47AM	118	44.5
-171 Mar 24	0.996	0.998	2:40	9:15AM	156	29.1
-164 Oct 29	0.993	0.994	1:34	2:34PM	76	29.3
-74 Dec 23	0.991	0.988	0:02	9:14AM	01	11.4
-19 Jan 24	0.953	0.942	0:24	12:19PM	15	30.9
77 May 10	0.961	0.956	1:28	3:37PM	43	43.5
89 Mar 30	0.934	0.919	0:35	12:06PM	18	53.5
98 Mar 21	0.975	0.959	1:24	9:01AM	73	26.1
136 Sep 13	0.973	0.973	2:34	12:01PM	71	54.5
192 Mar 1	0.975	0.978	3:17	9:36AM	199	25.6
230 Aug 25	0.950	0.942	1:09	8:07AM	40	24.9
352 Jul 27	0.961	0.940	2:15	1:27PM	57	67.5
411 Dec 1	0.974	0.975	2:24	2:51PM	119	20.0
619 Mar 21	0.983	0.985	2:33	11:05AM	95	46.3
623 Jan 6	0.934	0.911	1:07	3:43PM	39	15.8

Canfield, William W.
1902 *The Legends of the Iroquois, Told by "The Cornplanter."* A. Wessels Co., New York.

Dunham, David W.
1984 Review of *Canon of Solar Eclipses -2003 to +2526* by H. Mucke and J. Meeus (Astronomisches Büro, Vienna). *Archaeoastronomy* 7(1-4): 127-131.

Fiala, Alan D.
1985 Review of *Canon of Solar Eclipses -2003 to +2526* by H. Mucke and J. Meeus (Astronomisches Büro, Vienna). *Sky and Telescope* 69(2): 129-130.

Frachtenberg, Leo J.
1920 *Alsea Texts and Myths. Bureau of American Ethnology, Bulletin 67.* Smithsonian Institution, Washington, D.C.

Hardman, Clark, Jr., and Marjorie H. Hardman
1987 *The Great Serpent and the Sun. Ohio Archaeologist* 37(3):34-40.

Hawkins, Gerald S. (in collaboration with John B. White)
1965 *Stonehenge Decoded.* Dell Publishing, New York.

Irving, Washington
1892 *The Life and Voyages of Christopher Columbus.* George Putnam and Sons, New York.

Kluepfel, Charles
1984 MOON AND SUN (Computer program). Charles Kluepfel, 11 George St., Bloomfield, N.J.

Mitchell, Samuel A.
1969 *Eclipses of the Sun.* Greenwood Press, New York. Originally published in 1951 by Columbia University Press.

Mooney, James
1907-10 *Tenskwatawa. In Handbook of American Indians North of Mexico, Part 2, edited by Frederick W. Hodge, pp. 729-730. Bureau of American Ethnology, Bulletin 30.* Smithsonian Institution, Washington, D.C. Reprinted in 1979 by Rowman and Littlefield, New York.

1896 *The Ghost-Dance Religion and the Sioux Outbreak of 1890. In 14th Annual Report of the Bureau of American Ethnology for the Years 1892-1893, Part 2.* Smithsonian Institution, Washington, D.C.

Mosley, John
1986 Review of MOON AND SUN and ECLIPSE MAP by Charles Kluepfel (11 George St., Bloomfield, N.J.). *Sky and Telescope* 72(3):279.

Mucke, Hermann, and Jean Meeus
1983 *Canon of Solar Eclipses -2003 to +2526.* Astronomisches Büro, Vienna.

Oppolzer, Theodor Ritter von
1962 *Canon of Eclipses.* (Translated by Owen Gingerich.) Dover Publications, New York. Originally published in 1887 as *Canon der Finsternisse*, Imperial Academy of Science, Vienna.

Romain, William F.
1988a The Serpent Mound Solar Eclipse Hypothesis: Ethnohistoric Considerations. *Ohio Archaeologist* 38(3): 32-37.
1988b Terrestrial Observations at the Serpent Mound. *Ohio Archaeologist* 38(2):15-19.
1988c Geometry at the Serpent Mound. *Ohio Archaeologist* 38(1):50-54.

1987 Serpent Mound Revisited. *Ohio Archaeologist* 37(4):4-10.

Smiley, Charles H.
1975 The Solar Eclipse Warning Table in the Dresden Codex. In *Archaeoastronomy in Pre-Columbian America*, edited by Anthony F. Aveni, pp. 247-256. University of Texas Press, Austin.

Stahlman, William D., and Owen Gingerich
1963 *Solar and Planetary Longitudes for Years -2500 to +2000 by 10-Day Intervals.* University of Wisconsin Press, Madison.

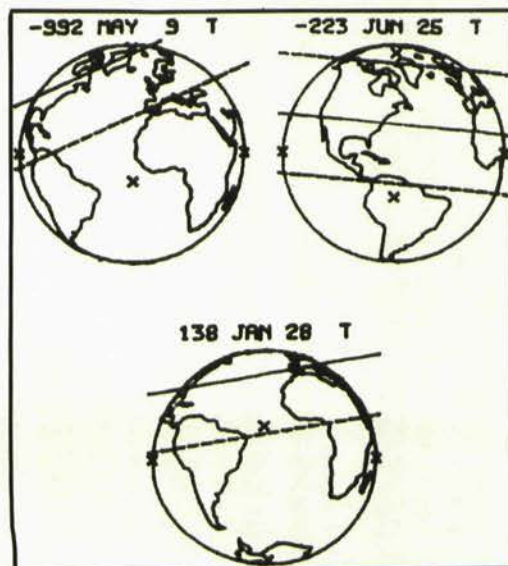


Fig. 1 (Romain) Central lines of total eclipses at the Serpent Mound. Modified from Mucke and Meeus 1983: 670, 722, 747.

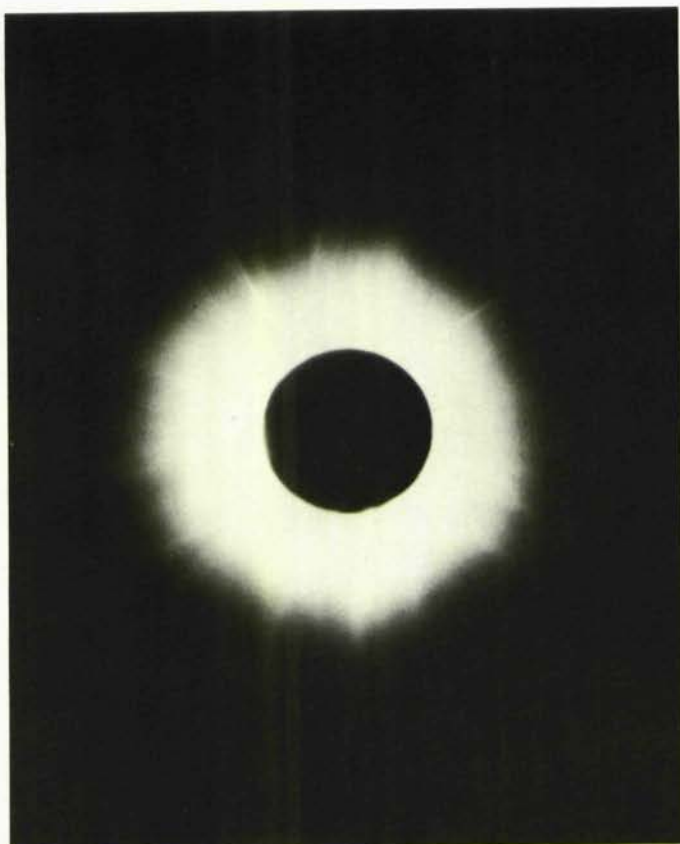


Fig. 2 (Romain) Total solar eclipse as viewed from India in 1980. Photograph courtesy of Jay M. Pasachoff, Hopkins Observatory, Williams College.

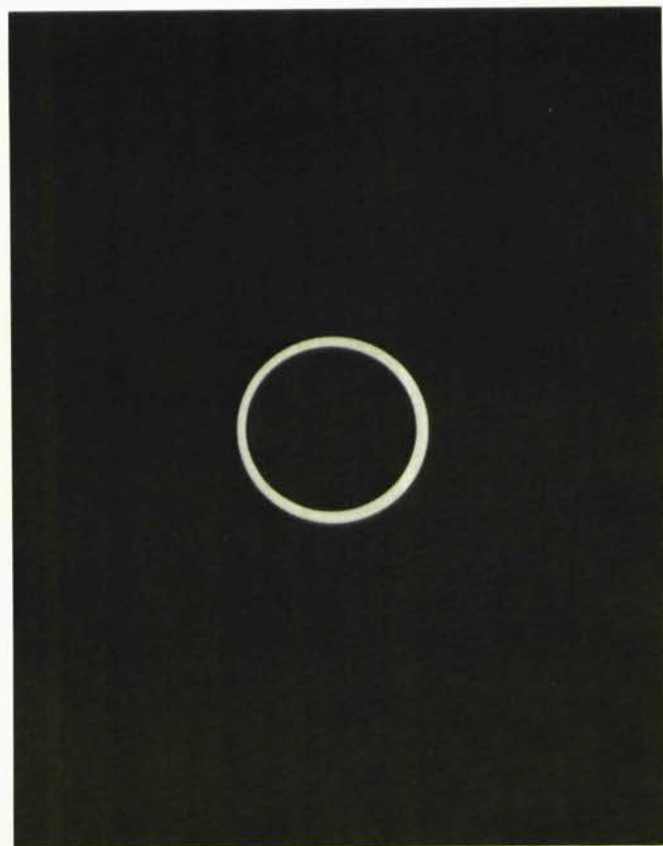


Fig. 3 (Romain) Annular solar eclipse as viewed from Columbia in 1973. Photograph courtesy of Jay M. Pasachoff, Hopkins Observatory, Williams College.

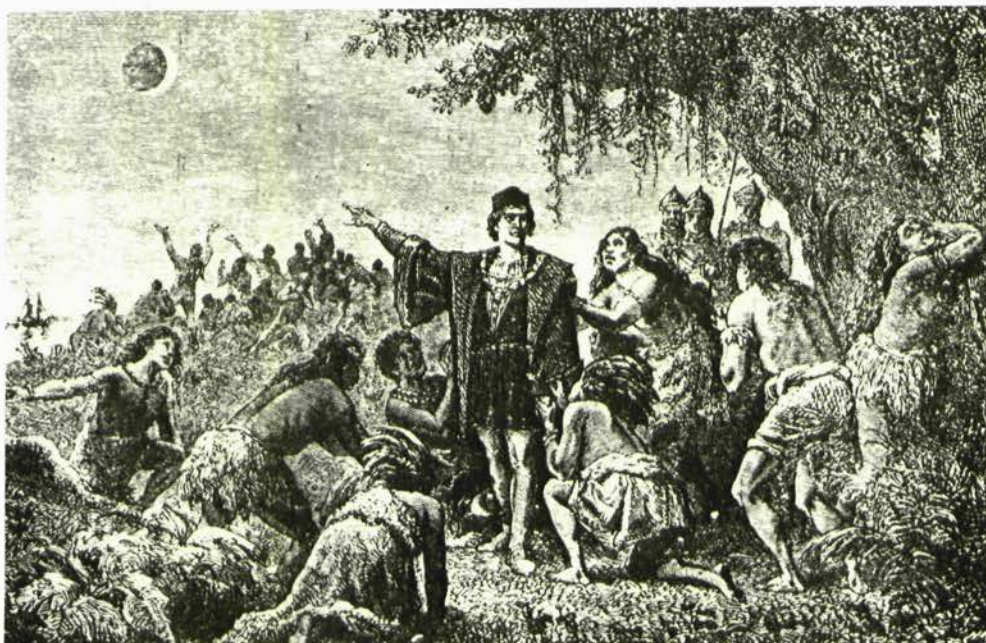


Fig. 4 (Romain) Jamaican Indians pleading with Columbus to restore the eclipsed moon. After Irving 1892:441.



Fig. 5 (Romain) Portrait of Tenskwat-awa, whose prediction of a solar eclipse in 1806 led to his acceptance as the "Shawnee Prophet." After Mooney 1907-10:729.

An Erie County Site

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The $\frac{3}{4}$ grooved adze shown in Fig. 1 was found in early March, 1986, in Erie County, Ohio, on a site located near Chappell Creek approximately 4 miles south of Lake Erie. This site is located on a sand hill of about 10 acres and the adze was found on the eastern edge away from Chappell Creek which is on it's western boundary.

Later in March a small hand adze was found in the same vicinity as the grooved adze.

The site has produced numerous points, flint fragments, stone tools, slate, hammerstones, a double-bitted slate chisel and 45 cupstones. As may be seen in Fig. 2, it is a multi-component site and a number of paleo points were found there by another collector.



Fig. 1 (Gerken) Grooved adze and hand adze. Grooved adze is $4\frac{1}{4}$ inches long. The bit and back are highly polished. Front and side views.

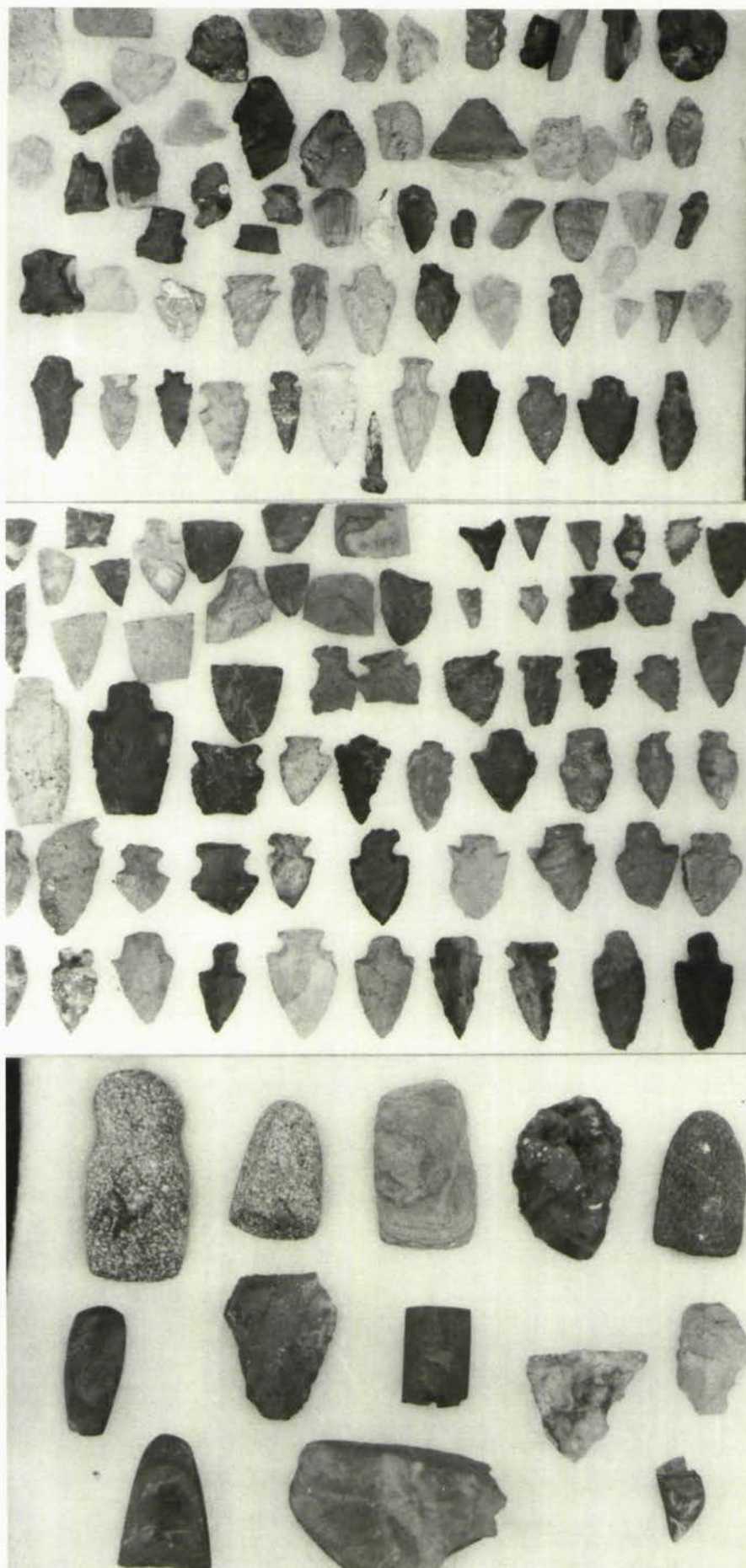


Fig. 2 (Gerken) Other artifacts from site.

"Great Pipes": The Hopewell—Copena Connection

By
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At a picturesque band of Paint Creek in the Scioto Valley of southern Ohio is one of the most impressive of Hopewellian sites, the Seip Group of mounds and earthworks. A combination of two circles, a square, and five mounds, it is located on the north bank of the Paint about 3 miles east of Bainbridge and 17 miles southwest of Chillicothe. Along with more than 400 other ancient sites, it helps make Ross County, Ohio, the largest concentration of prehistoric earthworks found in any county in the state. (See Mills, 1909: 269; Mills, 1914: 71-72.)

First mapped by Ephraim Squier and Edwin Davis in 1847 for their *Ancient Monuments of the Mississippi Valley* (see Squier and Davis, 1848: 4, 57-58), the Seip Group was explored by William C. Mills in 1906 and 1908 and by Henry C. Shetrone and Emerson F. Greenman from 1925 through 1929. Within the greater of the two circular enclosures of the Seip Group are two principal mounds. The larger one, at one time known as the Pricer Mound, is identified as "A" on the Squier and Davis map (see Figure 1) and was the one excavated in the 1920's by Shetrone and Greenman. The smaller one, actually three conjoined mounds, was long known as "the" Seip Mound, is identified as "B" on the map, and was the one earlier explored by Mills. (See Figure 1. See also Baby and Langlois, 1979: 16.)

In his 1909 report, Mills noted that the Seip Mound he had excavated [Mound "B"] had been the site of several Hopewell charnel houses and that in them he had found numerous burials, both cremated and uncremated, as well as great quantities of charred cloth, implements, and ornaments. Among the latter were sheets of mica cut into geometrical designs and figures, bear teeth set with pearls, pendants and beads of ocean shells, effigy eagle claws, copper ear ornaments in quantity, and even alligator teeth, the first found in any mounds of Ohio. (See Mills, 1909: 286, 295, 312, 317, 318.) In one grave alone he had found nearly 1,000 beads of ocean shell, each averaging a half-inch in length. When strung together they formed a necklace more than forty-two feet in length! (Mills, 1909: 312.)

Concluded Mills: "The builders of the mound [the Hopewell] had an intertribal trade, as evidenced by the copper from the Lake Superior Region, the ocean shells and alligator teeth from the far south, and mica from North Carolina." (Mills, 1909: 320-321.)

Curiously, Mills reported the discov-

ery of not one pipe. It remained for Shetrone and Greenman to find 8 in the nearby Pricer Mound, or Mound "A", in the 1920's. Compared to the 226 pipes found in the Mound City Group, the 47 excavated at the Hopewell Group, and the 142 discovered in the Tremper Mound, the Seip Group was hardly a treasure trove of pipes with a total of only 8. (See Shetrone and Greenman, 1931: 508.)

Interestingly, of the 226 found at Mound City, all were traditional Hopewell platform pipes, 15 of these being plain and 211 effigy. All 47 of those excavated at the Hopewell Group were similarly traditional Hopewell platform pipes, 44 of these being plain and 3 effigy. From the Tremper Mound down in Scioto County had come 79 plain and 63 effigy pipes, all of them of characteristic Hopewell platform style. (Shetrone and Greenman, 1931: 508.)

But wonder of wonders! Of the 8 pipes unearthed by Shetrone and Greenman in the Seip Mound "A", only 3 were platform pipes (2 plain and 1 effigy) while the other 5 were unlike any they had seen in other Hopewell sites. All 5 were large effigy pipes of *steatite*, in contrast to the much smaller platform pipes of characteristic Ohio pipestone. Three of the 5 were animal effigies while the other 2 were effigies of birds. One of the animal effigies represented "a dog in the act of eating a decapitated human head, held between the forepaws." The second also represented a dog. "Originally, something was held in the mouth of this piece, possibly the same object. All four feet of this effigy were broken off when found and perforations through the legs indicate that the broken parts had been re-united. These minor parts, unfortunately, were not recovered." (See Shetrone and Greenman, 1931: 416.)

The third of the large animal effigies appeared to be that of a bear. Its forepaws were "executed conventionally. Raised little more than a thirty-second of an inch above the surface, they extend down to within an inch and a quarter of one another and then disappear." (See Shetrone and Greenman, 1931: 419.)

The first of the large bird effigies was that of an owl, with "tertiary and covert feathers brought out in considerable detail by incision. Only the forward edges of the folded wings are in relief; elsewhere the outline of the wings is defined by a narrow incised line. A symmetrical conventionalized arrangement of the feet and claws of the owl [is]

portrayed on the under side of the pipe . . ." (See Shetrone and Greenman, 1931: 419.)

The last of the large bird effigies appeared to be that of a whippoorwill or night-hawk. "The only incised lines on this pipe, with the exception of incisions on the face, represent the spaces between the tips of the primary feathers. The effigy does not occupy the entire pipe; three inches of unembellished 'stem' protrude beyond the tail-feathers. The broken wing, the detached part of which was not recovered, shows the method by which the piece was mended." (See Shetrone and Greenman, 1931: 419, 422-423. See also Figure 2.) "The eyes of both effigies, of about the same diameter and one-eighth of an inch deep, show the remains of a red pigment." (1931: 423.)

In endeavoring to determine the origin of these 5 pipes and to explain their presence in an Ohio Hopewell mound, Shetrone and Greenman turned to an 1890 report by Gates P. Thruston entitled *The Antiquities of Tennessee*. In it they noted the illustration and description of 6 large effigy pipes found in the Tennessee-Cumberland region which resembled closely the 5 pipes they had found in the Seip excavations. Five of the 6 Tennessee pipes were made of *steatite*. One was the effigy of a duck; a second, a toucan; a third, a flying bird; a fourth, a walking bird; a fifth, a wolf or fox.

Observed Shetrone and Greenman, "In the position of the bowls of the pipes and in style, these pipes are identical with those from [the] Seip Mound . . ." Indeed, the flying bird effigy pipes from Seip and from the Tennessee-Cumberland were so similar as to be virtual look-alikes. (1931: 423.)

Concluded Shetrone and Greenman, "It is very evident that the five effigy pipes from the Seip Mound do not pertain to the Hopewell culture, and that they are typical of the Tennessee-Cumberland region. In view of the fact that the Hopewell peoples drew largely upon the southland for supplies of raw materials, it is not surprising to find that they at times availed themselves of finished specimens obtained through barter or in any manner from peoples of that region." (1931: 423-424.)

Among the "peoples of that region," it would appear that the Copena people were the actual sculptors of the large effigy pipes of *steatite* found in the Seip Mound of Ross County, Ohio. According to John A. Walthall, "The term 'Copena' was coined during the 1930's to name

the complex of burial mounds discovered in the Tennessee Valley region of northern Alabama. 'Copena' was derived from the first three letters of 'copper' and the last three letters of 'galena,' minerals frequently found in these mounds as burial furniture." (Walthall, 1979: 200.) "Characteristic artifacts associated with Copena mound burials were copper reel-shaped gorgets, ear-spools, bracelets, celts, and beads; marine shell cups and beads; long stemless projectile points; ground galena nodules; greenstone celts and digging implements; and large steatite elbow pipes, the earliest pipes of this form in Eastern North America." (Walthall, 1979: 200-201.)

Martin, Quimby, and Collier reported in 1947 (351-353) that among the diagnostic artifacts of the Copena culture were "large elbow-type pipes of polished steatite" but that "a less common type of steatite pipe was tubular and was carved in the form of animal effigies." In 1985, David S. Brose wrote that "The Copena complex developed . . . after A.D. 100. [Among grave goods in their burial mounds] were "pipes of local steatite. Many of the latter are simple elbow pipes, but some were carved as massive tubular or platform pipes with fully sculpted animal and bird effigies. The Copena 'great pipes' became a popular trade item after the first century A.D. and were exported to Illinois, Indiana, Ohio, and other locations throughout the Midwest." (See Brose, *et al*, 1985: 77, 78.)

Though Mills hypothesized extensive trade relations between the Hopewell and the peoples to the south (1909: 320-321), Martin *et al* conjectured "close identification" between the Hopewell and the Copena (1947: 351-353), and Brose cited the Copena "great pipes" as a "popular trade item" (see above). Walthall suggests that though the Copena were part of the "Hopewellian sphere of interaction" and though Ohio Hopewell and Copena coexisted for as long as 400 years, "current data support neither intensive nor continuous trade between these populations." Indeed, Walthall notes a number of sharp distinctions between Ohio Hopewell and Southern Copena that probably kept the two cultures at arm's length much of the time. Noting that only approximately 4,000 man-hours were required to construct a typical Copena mound while 200,000 man-hours were necessary "to raise a common Ohio Hopewell mound," Walthall believes that Ohio Hopewell resembled a "chiefdom level of socio-economic complexity," while the Copena were much more egalitarian. For example, one Ohio Hopewell grave "was accompanied by over 100 animal effigy pipes, another contained several hundred pounds of

rare obsidian, and another over 100,000 freshwater pearls. The egalitarian nature of the Copena society is demonstrated by the fact that the most elaborate burial ever discovered in this mortuary complex contained only eight objects." (Walthall, 1979: 202.)

Whether intensive and continuous or occasional and desultory, there appears to be no question that trade between the Ohio Hopewell and the Southern Copena did take place and that among the items brought into the Ohio Valley from the south were great pipes of steatite, in finished form, as effigies of birds and animals. In the illustrations which follow are a number of these pipes which have been found in Ohio and neighboring states while some which have been wholly southern in provenance are also presented for purpose of noting their similarities.

In Figure 2 we have already seen one of the five "great pipes" found by She-trone and Greenman in Ross County, Ohio, in Seip Mound "A", a Copena steatite pipe carved in the effigy of a whippoorwill, or nighthawk, in flight. Figure 3 shows a Copena falcon effigy pipe, also of steatite, found in Adams County, Ohio. In the collection of the Brooklyn Museum, it was featured in the handsome catalog of the 1985 exhibit of the Detroit Institute of Arts, *Ancient Art of the American Woodland Indians*, as were other Copena "great pipes", all of steatite, found in sites well north of the Tennessee-Cumberland region. Among these was a panther effigy found in Posey County, Indiana; a bird-and-owl double effigy, found in Scott County, Virginia; and an owl effigy found in Trigg County, Kentucky. (See Brose *et al*, 1985: 77-81.)

Figure 4 shows a handsome sparrow hawk effigy pipe, a relative rarity among southern bird effigy forms since it was fashioned from serpentine rather than steatite. Found in a vineyard in Erie County, Ohio, it was featured in an earlier article by D. R. Gehlbach in the *Ohio Archaeologist* (See Gehlbach, 1978: 30.)

Illustrated by John Baldwin in a still earlier issue of the same journal was a 9 inch long, 2 3/4 inch high steatite "great pipe" from Ross County, Ohio, in the effigy of a flying bird. (See Figure 5.) Suffering the fate so frequently encountered by flying bird effigies, both head and wings had already been broken off this piece by farm implements when it was found. After restoration by Baldwin, the same pipe now presents a finished appearance, as reproduced in Figure 6. (See Baldwin, 1974: 23; 1975: 7.)

In an article in the Spring 1981 issue of this magazine, Gordon Hart wrote about what he believed to be "The Greatest of the Great Pipes," one that Warren K. Moorehead had once de-

scribed as a "beautiful pipe of steatite . . . in the image of a duck floating high on the water. The head with a lifelike bill is a thing of beauty to see." Found in a rock shelter near the Ohio River in Meigs County, Ohio, it has lamentably been lost from view since 1941. It is reproduced here in Figure 7. (See Hart, 1981: 9-11.)

Perhaps the closest thing we have to a "bible" of prehistoric pipes is George A. West's *Tobacco, Pipes and Smoking Customs of the American Indians*, first published in two volumes by the Milwaukee Public Museum in 1934 and brought out again by the Greenwood Press in 1970. Concerning the large bird effigy pipes, West has written (pages 175-176) that they were usually flat-based, faced away from the smoker, and probably had long, unornamented stems of reed or cane. He also hypothesized that "Such pipes are rare and were likely the Calumets of the cultural tribe or tribes that made them. The most remarkable of them must have been regarded as public property, and were probably in the possession of one of the chiefs and medicine-men."

Among the more than a dozen great pipes of bird effigy form illustrated in West, one that particularly caught my eye (reproduced here as Figure 8) is a steatite image of a bird with upturned head and hooked bill found near Manchester in Coffee County, Tennessee. With a length of only 6 inches, a height of some 3 inches, and a width of 2 inches, it is more diminutive than most of the other great pipes shown in this article and in West. (See West, 1970: 648-649.)

Strikingly similar though somewhat larger than the bird effigy pipe from Tennessee is one I recently acquired from the Joseph E. Meyer Collection. (See Figure 9.) From Jasper County, Indiana, south of the Kankakee River, it is 7 1/2 inches long, 3 inches high, 1 3/8 inches wide, and weighs 1 1/4 pounds. Fashioned from steatite, it is well-polished, flat-based, gray and tan in color, has sharply delineated wings, an upturned head with pronounced beak, and faces away from the smoker. Like the one from Coffee County, Tennessee, its sculptor has carefully depicted both the iris and the pupil of each eye. Unlike the one found in Tennessee, indeed, unlike the majority of the other great pipes, its bowl is angular rather than curved.

Though there remains the possibility that some of the great effigy pipes found in Ohio and neighboring states may well have been indigenous to this area, the stronger likelihood is that they were crafted in the south and brought north as finished products in the intermittent trade between Ohio Hopewell and Southern Copena, with Ohio's jewel-like

Flint Ridge flint one of the elements in the exchange.

Acknowledgements

I am grateful to the Ohio Historical Society for permission to reproduce the map detail shown as Figure 1 and the whippoorwill or nighthawk pipe shown in Figure 2; to the Brooklyn Museum for permission to reproduce the falcon effigy pipe photographed by Dirk Baker and shown as Figure 3; and to the Milwaukee Public Museum for permission to reproduce the bird effigy pipe illustrated here as Figure 8. To the Audio Visual Department of Miami University goes continued appreciation for invaluable photographic assistance.

References

- Baby, Raymond S. and Suzanne M. Langlois
1979 "Seip Mound State Memorial: Non-mortuary Aspects of Hopewell," in *Hopewell Archaeology: The Chillicothe Conference*, edited by David S. Brose and N'omi Greber. Kent State University Press, Kent, Ohio.
- Baldwin, John
1974 "Some Ohio Artifacts in Indiana." *Ohio Archaeologist*, 24 (4): 23.
1975 "A Restored Pipe." *Ohio Archaeologist*, 25 (1): 7.
1981 "The Owensboro Great Pipe." *Ohio Archaeologist*, 31 (1): 8-9.
- Brose, David S., James A. Brown, and David W. Penney
1985 *Ancient Art of the American Woodland Indians*. Harry N. Abrams, Inc., Publishers, New York, in association with the Detroit Institute of Arts.
- Gehlbach, D. R.
1977 "The Massive Effigy Pipe Form: An Enigma to Archaeological Research." *Ohio Archaeologist*, 27 (4): 20-21.
1978 "A Hawk Effigy Pipe from Northern Ohio." *Ohio Archaeologist*, 28 (2): 30.
1980 "Primitive Man's Portrayal of an Effigy Bird Pipe." *Ohio Archaeologist*, 30 (2): 22.
1987 "An Owl Effigy Pipe of Unknown Origin." *Ohio Archaeologist*, 37 (1): 22.
- Hart, Gordon
1981 "The Greatest of the Great Pipes." *Ohio Archaeologist*, 31 (2): 9-11.
- Martin, Paul S., George I. Quimby, and Donald Collier
1947 *Indians Before Columbus*. University of Chicago Press.
- Mills, William C.
1909 "Explorations of the Seip Mound." *Ohio Archaeological and Historical Publications*, 18: 269-321.
1914 *Archaeological Atlas of Ohio*. Ohio State Archaeological and Historical Society.
- Molloy, Paul F.
1957 "Four Ohio Pipes." *Ohio Archaeologist*, 7 (3): 88-90.
- Potter, Martha
1961 "The McBride Effigy Pipe." *Ohio Archaeologist*, 11 (2): 50-51. Not

to be confused with Copena great pipes, this fragment of a tubular sandstone pipe was found in Butler County, Ohio, and is cited here only for purposes of contrast.

- Shetrone, Henry C. and Emerson F. Greenman
1931 "Explorations of the Seip Group of Prehistoric Earthworks." *Ohio Archaeological and Historical Quarterly*, 40 (3): 349-509.
- Squier, Ephraim G. and Edwin H. Davis
1848 *Ancient Monuments of the Mississippi Valley*. Smithsonian Institution, Washington.
- Walthall, John A.
1973 *Copena: A Tennessee Valley Middle Woodland Culture*. Doctoral disser-

tation. Department of Anthropology, University of North Carolina. University Microfilms International.
1979 "Hopewell and the Southern Heartland." In *Hopewell Archaeology: The Chillicothe Conference*, edited by David S. Brose and N'omi Greber. Kent State University Press, Kent, Ohio.

- West, George A.
1934 *Tobacco, Pipes and Smoking Customs of the American Indians*. Originally published in two volumes in 1934 by the Milwaukee Public Museum in their *Bulletin* series. Reprinted in 1970 by the Greenwood Press Publishers, Westport, Connecticut.

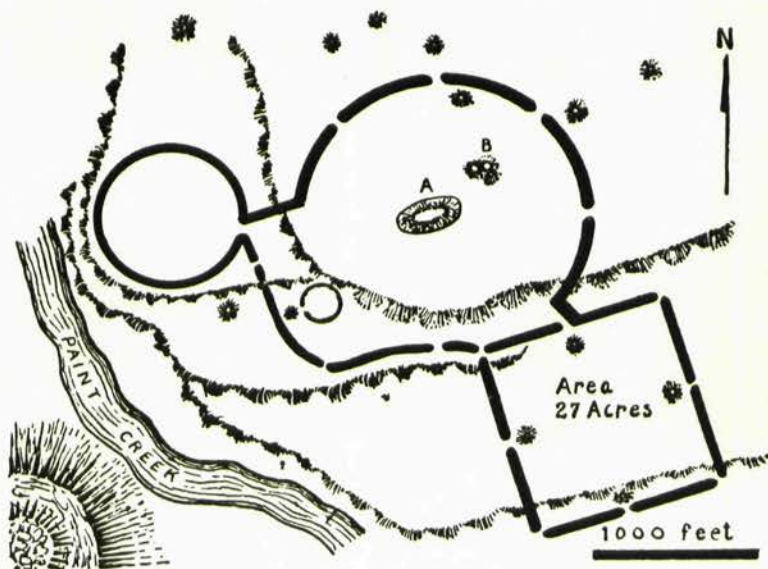


Fig. 1 (Shriver) Detail from the 1847 map of the Seip Group of Mounds and Earthworks prepared by Squier and Davis. Reproduced with amendments by Shetrone and Greenman in 1931. Shown here courtesy of the Ohio Historical Society. Mound A was explored by Shetrone and Greenman, 1925-1929; Mound B by Mills, 1906-1908.

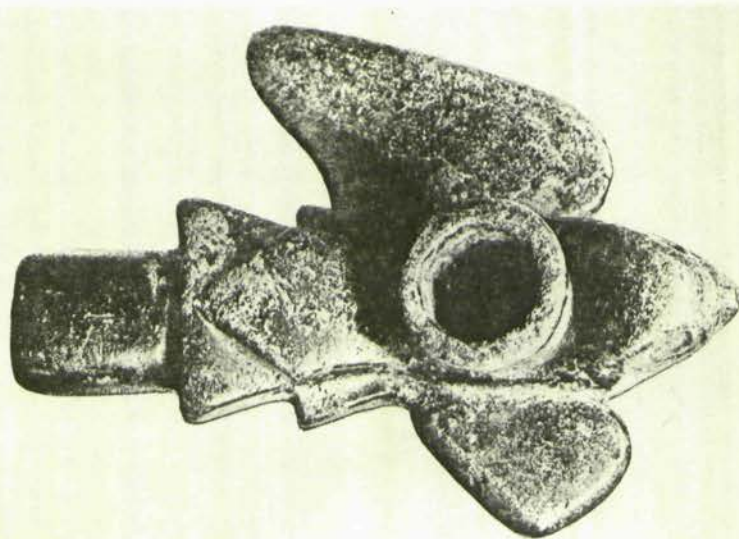


Fig. 2 (Shriver) Large steatite effigy pipe of a whippoorwill or night-hawk in flight. Found in Mound A, Seip Group, by Shetrone and Greenman. Reproduced here courtesy of the Ohio Historical Society.

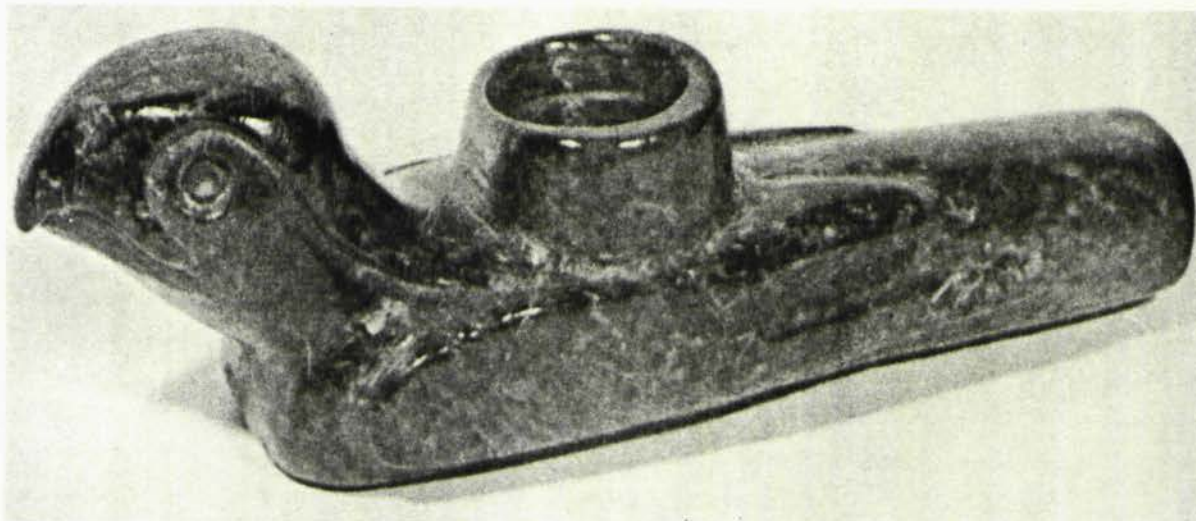


Fig. 4 (Shriver) A sparrow hawk effigy pipe of serpentine from Erie County, Ohio. Reproduced here from an article by D. R. Gehlbach, "A Hawk Effigy Pipe from Northern Ohio," *Ohio Archaeologist* 28(20): 30, Spring, 1978.



Fig. 5 (Shriver) A 9 inch long steatite flying bird effigy pipe from Ross County, Ohio, at one time part of the Wachtel Collection in Dayton. With head and wings broken, this great pipe was first highlighted by John Baldwin in his 1974 article "Some Ohio Artifacts in Indiana," *Ohio Archaeologist*, 24(4): 23, and is here reproduced from that article.



Fig. 6 (Shriver) The same flying bird effigy pipe illustrated in Fig. 5 after restoration of head and wings by John Baldwin. Reproduced here from his 1975 article, "A Restored Pipe," *Ohio Archaeologist*, 25(1): 7.



Fig. 7 (Shriver) Gordon Hart called this exceptional duck effigy pipe "The Greatest of the Great Pipes" in his 1981 article in the *Ohio Archaeologist*, 31(2): 11. It is reproduced here from that article.



Fig. 8 (Shriver) A bird effigy pipe of steatite found in Coffee County, Tennessee. The plate on which this pipe was photographed appears in George West's *monumental Tobacco, Pipes and Smoking Customs of the American Indian*. (See Plate 84, pages 648-649; also, page 176.) Reproduced here courtesy of the Milwaukee Public Museum.



Fig. 9 (Shriver) At one time part of the Joseph E. Meyer Collection, this 7½ inch long, 1¼ pound bird effigy pipe of steatite was found in Jasper County, Indiana. Note the similarity in form and detail between this pipe and the one from Tennessee pictured in Fig. 8.



Fig. 3 (Shriver) Falcon effigy pipe of black steatite found in Adams County, Ohio. Copena culture, Middle Woodland period, ca. A.D. 100-400. In the collection of the Brooklyn Museum (69.84, Charles Stewart Smith Memorial Fund), it is reproduced here courtesy of the Brooklyn Museum. Photographed by Dirk Bakker, it was featured in the 1985 *Ancient Art of the American Woodland Indians* by David S. Brose, James A. Brown, and David W. Penney, published by Harry W. Abrams of New York in association with the Detroit Institute of Arts.



Fig. 10 (Shriver) Another view of the same pipe illustrated in Fig. 9.

Two Flint Artifacts

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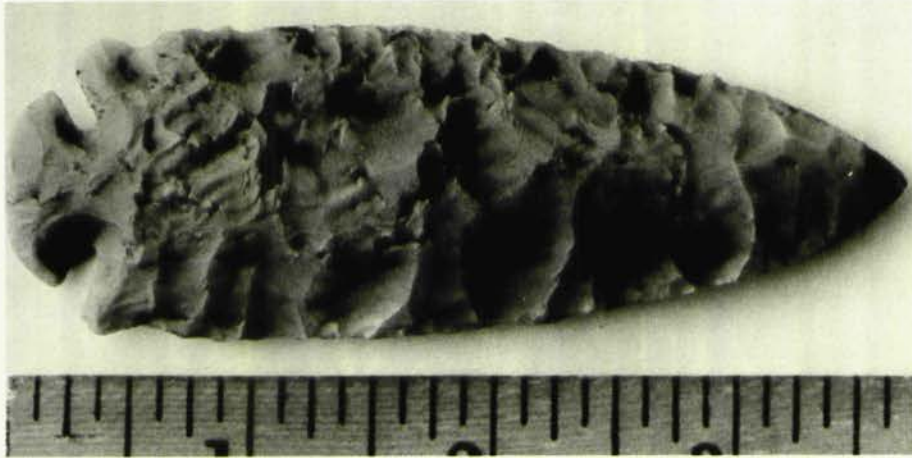


Fig. 1 (Shirley) This 3¾ inch dovetail is made of Flint Ridge flint gray chalcedony with a dark pink tip and a blue streak.



Fig. 2 (Shirley) This plano lanceolate point was found near Chillicothe, Ohio. It is slightly over 5 inches long and is made of tan and brown flint.

A Tuscarawas County Axe

By
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Fig. 1 (Farrow) A large ¾ grooved axe made from green and brown granite porphyry. It was found many years ago in Tuscarawas County, Ohio. It's length is 7¼ inches and it is 5 inches wide. Collection of John Kohr, Strasburg, Ohio.



More On Great Serpent Maps

By

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INTRODUCTION

Fletcher and Cameron (1988) have produced yet another map of the Great Serpent and still another critique of our work (Hardman and Hardman 1987a, 1987b, 1987c) with the Great Serpent effigy.

THE MAP

First the map, Figures 1, 2, 3, 4, and 5 compare the Fletcher and Cameron map with our map and Romain's (1987b) map. The same negatives and procedures were used as with the comparisons with Romain's 1987 map (Hardman and Hardman 1988). In these last two papers we used 8 x 10 film in an attempt to preserve fine detail instead of the paper negative materials which were used in the first map comparisons manuscript. Our effort in the over printing was to secure the best possible over-all match. We believe the agreement between the three maps (Figures 4, 5 and 6) is as good as can be expected of a difficult earthwork mapping problem and with the maps being constructed by use of different techniques. Romain believes his accuracy to be within three to six inches (Romain 1987b:38):

In some instances the precise edges of the earthwork were difficult to determine, however, all coordinate points should be accurate within ± 6 inches. Most of the points are probably accurate within ± 3 inches.

Fletcher and Cameron also believe their accuracy to be within six inches: We feel confident in stating that the map data points are accurate and repeatable to within 6 inches, and probably better than that.

We observe in these map comparisons that there are differences between Romain's map and the Fletcher and Cameron map that will amount to several feet. We pointed out in our first paper (Hardman and Hardman 1987a) that reliably determining the edge of the earthwork was a problem.

Much of the legend on the Romain and Fletcher and Cameron maps had to be removed to avoid confusing overprinting. This legend detail is referred to by directing the reader to the original papers in our captions.

The scale of the Fletcher and Cameron map is confused. The total length of the scale should be 100 feet not 200 feet as labeled.

Both Romain (1987a) and Fletcher and Cameron (1988) miss an important point in their critiques of our work. There is no more accurate way of deter-

mining the outlines of an earthwork than from a vertical aerial photograph if all of the surface conditions are right and there is ground control. Romain's and Fletcher and Cameron's work simply support our conclusion. This conclusion was (Hardman and Hardman 1988a):

We doubt that our outline of the Great Serpent can be improved to a degree that would be worth the effort.

This conclusion still stands. Aerial photographs, both the verticals and obliques, show the contours of the Great Serpent to be the smooth rounded features to be expected from the century of erosion since reconstruction instead of the contours a surface survey shows when rounding and smoothing from observation is omitted.

THE CRITIQUE

The Fletcher and Cameron (1988) paper gives another survey of the Great Serpent. They critique our paper on the basis of accuracy, the accuracy of their survey and the soundness of their theoretical concepts, then point out that accuracy with the Great Serpent features is not possible because of reconstruction, erosion etc.

There is much that we agree with in the Fletcher and Cameron paper. However, we need to point out some differences in the thinking and reasoning involved in the critique.

First, our original illustrations (Hardman and Hardman 1987c, Figures 10, 11 and 12) show the deviations of the convolutions of the serpent from perfect orientation with the solstices. Our conclusion at that time amounted to the intriguing possibility that the convolutions were designed to match the solstice and mid-point positions of the sun on the horizon. (We will quote major sections of our first conclusions at the end of this paper). Also we pointed out (Hardman and Hardman 1987a):

Our rule of thumb in working with the reconstructed Great Serpent is to consider Putnam's reconstruction accurate with no greater error than ten feet.

The greatest deviation from the precise solstice orientation is in convolutions 1K2 at the back of the neck. This convolution is in a position against a bank and thus would be more likely to be damaged by plowing and erosion both before and after reconstruction.

We do not agree that there exists adequate theory or hypothesis concerning the use of and the development of the

study of positions of the sun on the horizon. The implied theories of solstice accuracy do not fit the data. We do not believe that the date closest the time of the solstice was ever determined by a pre-technological people by direct observation at the time of the solstice. We do not know of a description of a technique used by a pre-technological culture for determining the date of the solstice by direct observation at the time of the solstice. We do not believe that absolute accuracy in our terms to fractions of a degree is necessary or even desirable in demonstrating that the ancients used positions of the sun on the horizon for esoteric and practical purposes. A horizon calendar associating events with positions of the sun on the horizon, even when there is no concept of a calendar, has high survival value for a culture. The important consideration involved in demonstrating that an early culture used horizon positions of the sun is the determination that a system existed. A secondary consideration is the demonstration that the system was accurate to a usable or practical degree. The primary evidence is a system and not the accuracy of any single alignment.

Solstice Concepts

There are two factors in the study of solstice positions: (1) marking the position of the solstice on the horizon from an observation position and (2) determining the date nearest the point of the solstice.

Marking the approximate position or point of the solstice on the horizon is a simple and direct observation. The accuracy of this position is a legitimate matter about which to be curious and also for study. An observed position of the sun on the horizon is essentially meaningless and fortuitous unless it can be demonstrated that it is a part of a system of observing horizon positions of the sun.

A procedure for determining a date nearest the solstice point is to observe positions of the sun away from the solstice point when movement along the horizon is easy to observe and then determining the number of days from this point to the solstice. This procedure requires both the observation position and a marker (foresight). Stevenson (1904:109) describes a Zuni procedure:

The sun priest makes daily observations of the sunrise at a petrified stump, which stands on the outskirts of the village . . . announces from

the house top that the winter solstice will occur in ten days.

The only statement of the accuracy of naked eye observation of the positions of the sun on the horizon for determining cultural necessities such as solstices, planting time, dates of ceremonies etc. that we know of, is Parsons (1925: 120):

From 1921 to 1924 Crow-wing kept memoranda of planting dates and these, like solstice dates have varied only by a day or two from year to year.

For examples of further discussions in this area see Zielik 1983 and 1988 or O'Brien and McHugh 1987.

Questions

Fletcher and Cameron have several questions concerning archaeoastronomy at any particular site with some that may be answered and others that cannot be answered. Actually most of the questions we can ask about prehistoric astronomy or cultures we can not answer.

A Fletcher and Cameron question: "What characteristics of the site suggest astronomical uses exclusively?"

The main characteristics of the Great Serpent that suggest a relationship with the sun include the number of the convolutions matching what our culture would consider important points; the orientation of the convolutions matching azimuths or the horizon positions of the sun to some degree on an eroded, damaged and reconstructed site; the whole effigy constituting a complete system; and the widespread association of the serpent with the sun. Note, we say *suggest* here and in our earlier paper.

"Exclusively" is a problem with this question generally. The prehistoric peoples of North America had a marked tendency to build over and use constructions for many purposes. The Great Serpent must have had multiple uses in the culture that constructed it. The uses and procedures would relate to what we call mythology, cosmology, etc.

Another Fletcher and Cameron question: "Has the site been altered or extensively disturbed by man or nature since construction?" The answer to this question about the Great Serpent is common knowledge. The Great Serpent, as it exists today, is the product of an unknown (actually) culture plus an unknown period of the erosive forces of nature plus Putnam's reconstruction. This sum precludes any conclusion based upon accurate surveys at the present time.

A Fletcher and Cameron question: "Did the builders possess the technology required?" One wonders at this sort of question. The technology required was or is an ability to observe details of

natural events with the unaided eye. This is an ability we must assume the early people were excellent at. Their existence or survival depended upon it. We consider the assumption that prehistoric peoples observed and used celestial events to be a preferred assumption. How early? At least for tens of thousands of years, see Marshack (1972).

The observation of the apparent movement of the sun on the horizon, at points away from the solstices, is an easy observation with the unaided eye. The requirement for reasonable or usable accuracy is a fixed observation position and a constructed or natural marker on the horizon.

Fletcher and Cameron question: "Where did the builders stand to make sightings?" We made no attempt to answer this but did suggest the areas of the convolutions and the oval. We also suggested the possibility of no practical use. We believe the most profitable place in the area from which to obtain *solid evidence* of alignments with positions of the sun on the horizon is the ridge we call Solstice Ridge. It should be gone over with a trowel.

Another Fletcher and Cameron question: "What aids, mechanical or otherwise, did they use to make sightings with?" This is essentially the same question as the one concerning technology. With studies of this sort we are dealing with a concept and procedure rather than a mechanical aid. As we keep pointing out, the observation of the apparent movement of the sun along the horizon is an easy observation when the observations are made at points away from the solstices.

Fletcher and Cameron question: "Why did they build it as they did and not some other way?" This is an important sounding question. We superficially leafed through our memories, bibliographies and papers and could not come up with another guess as to why the convolutions of the Great Serpent are constructed the way they are except ours. Any further consideration of this question much beyond something of this nature occupies much of the literature of *Homo sapiens*.

East and West

Fletcher and Cameron: "... bisecting that angle [between winter and summer solstices from a position] to obtain the equinoxes will not produce a true east or west unless the entire horizon of interest is at 0 degrees elevation; hardly ever the case, except possible in Kansas and certainly not at the Great Serpent ... alternately a day count would cause other problems ..."

In our section related to this we were obviously talking about a possible principle. We did not try to determine how

much of this or the following counting procedure or both could have been used at the Great Serpent. If our memory of Ohio archaeological sites is correct, there are sites in Ohio with very even horizons. There are also hill-top sites and even if the principle had come from "Kansas" there is plenty of evidence for widespread contact over long distances among North American cultures.

Prehistoric peoples generally did not have courses in elementary physical science or astronomy and knew nothing of "the elliptical nature of the Earth's orbit" so they went right on with their counting as a simple possible means of determining a midpoint between the solstices or "true" east or west. Seriously, perhaps we should have said approximately "true" east or west.

We do not know of studies of this accuracy of east-west orientations at archaeological sites. Our point remains, the east-west direction or midpoint between the solstices could be simply determined and with a *reasonable* accuracy by geometry or counting or both.

Tolerances

Fletcher and Cameron note: "... no solstice azimuth provides an accurate match to its matching coil [convolution] centerline within reasonable tolerances for archaeoastronomy." This is correct. There are no *perfect* matches on the reconstructed serpent. As for the "tolerances for archaeoastronomy," do they exist? Are they tolerances where the apparent movements of the sun on the horizon are concerned and for observing with the unaided eye or simply procedures for map making? Tolerances for map making becomes an accuracy sufficient for the purposes for which the map was constructed. A survey is not the end result of a study of alignments to the sun on the horizon. The only purpose of the survey or map is for the convenience of study away from the site.

Related to the problems of mapping, there is frequently no certainty about precise horizon elevations within a few degrees at prehistoric sites. The closeness and height of vegetation remains an assumption.

North

Both Romain (1987a) and Fletcher and Cameron imply that we had stated we had "problems finding true north." There was no problem. We stated that we determined north using isogonic charts. Also, we stated that true north should be determined astronomically just in case there was a serious error. The small error turns out to be insignificant considering reconstruction and the vagueness of details of the Great Serpent features.

Approximations

Fletcher and Cameron were concerned about "the constant use of terms like 'approximately, approaches, could have been, rounds to, relatively, estimated,' etc." We didn't check all of these but they sound right. We were and are dealing with an eroded, damaged and reconstructed earthwork. Precision and precise statements do not seem to be very reasonable. Also in this connection, Fletcher and Cameron believe "postulating every conceivable alignment" is poor technique. (We apparently missed some.) Every possible alignment should be considered. A system is the sort of evidence to look for.

Hand Instruments

Fletcher and Cameron: "The remarks about accuracy not being possible at the Serpent, and that a hand-held compass is equal in accuracy to a transit is rather astounding." This sentence by Fletcher and Cameron suggest both a lack of familiarity with accurate hand instruments and a limited experience with archaeological sites. We described Bruntons and Suuntos briefly (Hardman and Hardman 1988) and there are other such instruments. They certainly beat guessing. We have seen transits set up to "measure" azimuths on short, irregular lines where the positioning of the transit was an obvious judgment determination. A very short shift in the positioning would mean degrees. Averaging several hand-held sightings would be as good or better in this sort of situation. We know of cliff observation positions where the gyrations necessary to set up a transit, and off center, were amusing. Again, a Brunton or Suunto measurement would have been better. It is difficult to set a transit up on a ladder to measure azimuths of high windows in pueblos, etc. Further Fletcher and Cameron give us credit for something different from what was in our paper (Hardman and Hardman 1987a). We quote from our paper, "accurate hand-held instruments, in many instances, are more reliable and manageable than a transit at archaeological sites."

Solstice Knob

Fletcher and Cameron observed Solstice Knob "through a transit telescope" and concluded it "turns out to be a stand of trees." The U.S. Geological Survey, Sinking Spring Quadrangle map shows two elevations either of which could be Solstice Knob. The closest one is an 825 foot elevation at about one and one-half miles from the Serpent. The other possible Solstice Knob is a 950 foot elevation at a distance of about two and one-half miles.

Geometry

We suggested a possible source of the equilateral triangle at earthworks (Hard-

man and Hardman 1987c). Fletcher and Cameron believe this source isn't necessary and state "Small differences between the original and restored version could add up to large sighting and positional errors on an object the size of the serpent." We agree, this is a primary problem with work at the Great Serpent. This also applies to the concentric circles. We obviously drew the circles from one point. If the points of contact with the convolutions are shifted this will obviously shift the center of the circle. We are also concerned with the possible.

Prehistoric people could easily do the circles we describe. Fletcher and Cameron's ellipse is interesting. The problem is, how was it formed on the Great Serpent promontory?

Units of Length

We hold no particular brief for the units of measure. Romain's (1988) units seem to be as good as the units we suggest and he still uses the same principle we used of something on the site as a standard. Also, we like the octagon idea. A circle something like we describe seems necessary for its construction on the Great Serpent promontory. How otherwise could the a portion of an octagon be constructed on the promontory? (A source for the length, relationship etc. of octagon sides would be an excellent research project for someone in the Ohio area.) All of this is possible maybe, plausible maybe. The main point now is there is a remarkable amount of regularity about the Great Serpent.

Note also, Romain stays with the concept of a relationship of the Great Serpent and the sun and provides some reasoning for the oval. We also consider the oval to be a sun symbol at the Great Serpent and a widespread sun symbol in archaeological contexts with possibly multiple origins.

Analogy

Fletcher and Cameron: "Drawing analogies between cultures separated in time by many centuries is risky." This sort of statement is both accurate and superficial. There are such considerations as development and continuity, for example. A more usual, serious and related hazard is projecting aspects of our own culture to another culture or to the prehistoric culture. Attaching meaning requires everything at our disposal.

CONCLUSION

Our conclusion remains, considering erosion, destruction, reconstruction etc., there is an intriguing possibility that the system of convolutions of the Great Serpent were intended originally to match positions of the sun on the horizon. We quote a section of our original (Hardman and Hardman 1987c) concluding statement:

There was some use made of the Great Serpent complex. The Great Serpent remnant, using our cultural concepts, may have been an observatory system, a part of an observatory system, or simply a record of the apparent movement of the sun along the horizon. The cultural verbalizations could range from what we would call cosmology or a calendar to a specific content that is outside our understanding or ability to determine. The culture that built the Great Serpent, like most early cultures, is/was an alien culture to us. Our reasoning is no basis for interpretative meaning. We should point out that the association of the serpent with the sun is not unique. This association is common with early cultures. Check prehistoric Mesoamerican cultures for examples.

References

- Fletcher, Robert and Terry Cameron
1988 Serpent Mound, A New Look at an Old Snake In-The-Grass. *Ohio Archaeologist* 38(1): 55-61.
- Hardman, Clark Jr. and Marjorie H. Hardman
1987a A Map of the Great Serpent Effigy Mound. *Ohio Archaeologist* 37(1): 35-39.
1987b An Analysis of the Maps of the Great Serpent Mound. *Ohio Archaeologist* 37(2): 18-25.
1987c The Great Serpent and the Sun. *Ohio Archaeologist* 37(3): 34-40.
1988 On Romain's "Serpent Mound Revisited" Paper. *Ohio Archaeologist*.
- Marshack, Alexander
1972 The Roots of Civilization. The Cognitive Beginnings of Man's First Art, Symbol and Notation. McGraw Hill, New York.
- O'Brien, Patricia J. and William P. McHugh
1987 Mississippian Solstice Shrines and a Cahokian Calendar: An Hypothesis Based on Ethnohistory and Archaeology. *North American Archaeologist* 8(3): 227-247.
- Parsons, Elsie Clews (Ed.)
1925 A Pueblo Indian Journal 1920-1921. *Memoirs of the American Anthropological Society*, No. 32. Kraus Reprint Corp., New York, 1964.
- Romain, William F.
1987a Serpent Mound Revisited. *Ohio Archaeologist* 37(4): 5-10.
1987b The Serpent Mound Map. *Ohio Archaeologist* 37(4): 38-39.
- Stevenson, M. C. (Mrs.)
1904 The Zuni Indians, Their Mythology, Esoteric Fraternities and Ceremonies. *Twenty-third Annual Report of the Bureau of American Ethnology*. Government Printing Office: Washington.
- Zeilik, Michael
1983 One Approach to Archaeoastronomy: An Astronomer's View. *Archaeoastronomy VI* (1-4): 4-7.
1986 Keeping a Seasonal Calendar at Pueblo Bonita. *Archaeoastronomy IX* (1-4): 79-87.

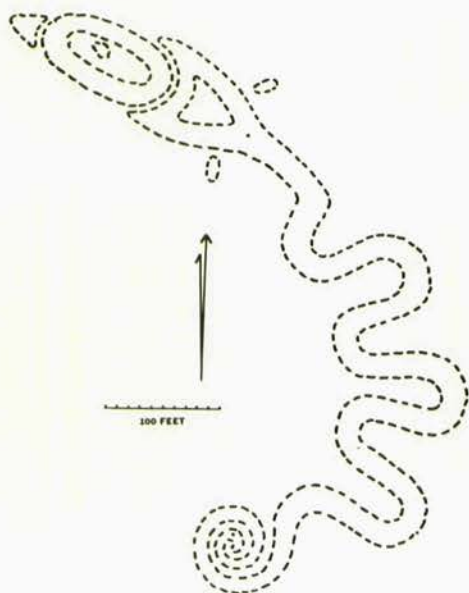


Fig. 1 (Hardman-Hardman) Hardmans' master map (Hardman and Hardman 1987b) used for evaluating Great Serpent maps.

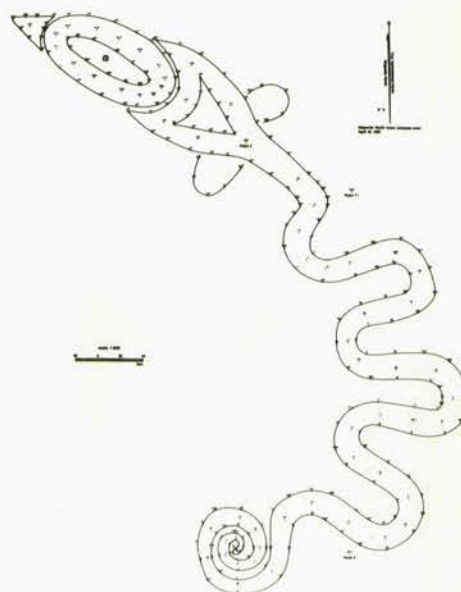


Fig. 2 (Hardman-Hardman) Romain (1987b) map. Refer to Romain 1987b for legend detail including credits and copyright data.

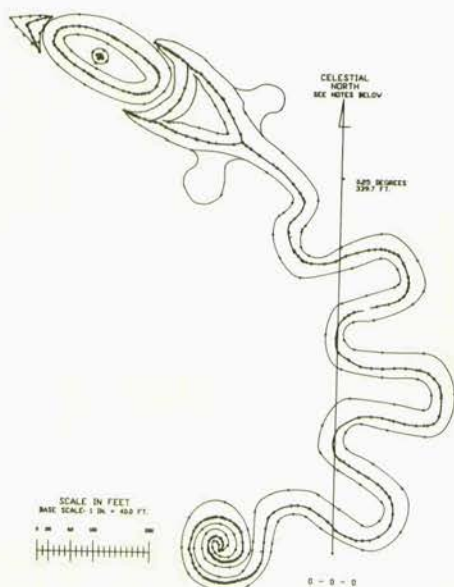


Fig. 3. (Hardman-Hardman) Fletcher and Cameron (1988) map. Refer to Fletcher and Cameron 1988 for legend details and credits.

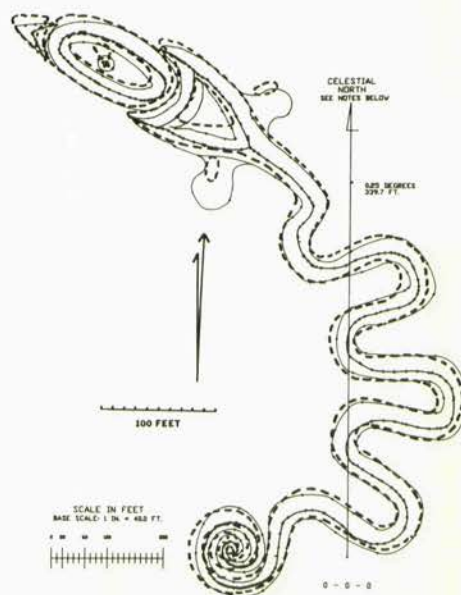


Fig. 4 (Hardman-Hardman) Hardman and Fletcher and Cameron maps overprinted for comparison.

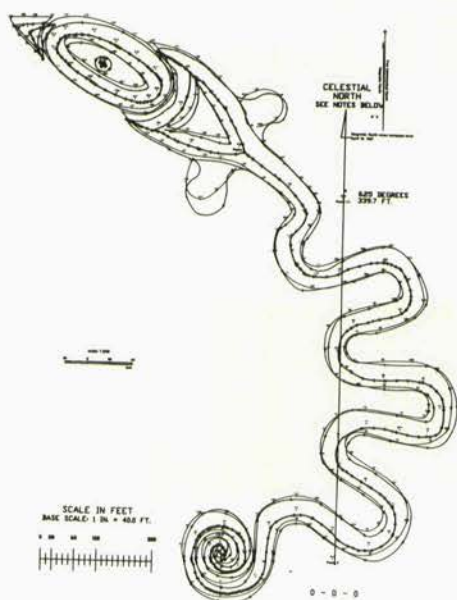


Fig. 5 (Hardman-Hardman) Romain and Fletcher and Cameron maps overprinted for comparison.

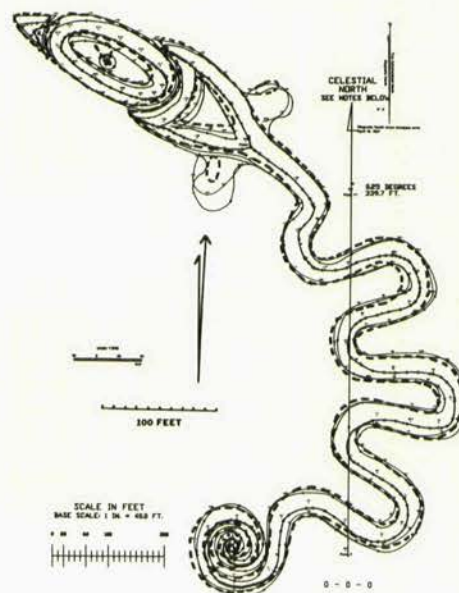


Fig. 6. (Hardman-Hardman) Hardman and Romain, and Fletcher and Cameron maps overprinted for comparison.

A Grooved Adze

By
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This grooved adze is made of gray diorite with a pink phenocryst. It was found May 16, 1988, in a plowed field in Seneca County, Ohio. It won best stone tool award at the May 1988, ASO meeting.

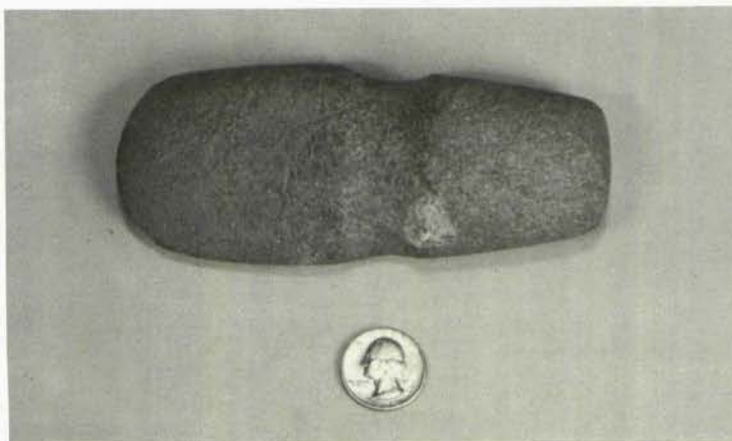


Fig. 1 (Hicks) Grooved adze from Seneca County, Ohio.

A Bust Birdstone Type

By

Robert N. Converse

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There are several styles of bust birdstones, all of which are rare. The best known and the most numerous is the type with a head like that found on popeyed bar type birdstones, but only the head and shoulders are depicted. The eyes are like toadstools, cylinders, buttons or simply small cones. The bottom is a disc-like base, oval or round and its underside may be slightly convex, flat or concave.

Normally the base is perforated front and rear with small conical holes drilled from the bottom, but it is pertinent to note that a significant number of them are not drilled but otherwise completely finished.

A wide range of colorful and unusual stone is found in this variety such as quartzite, gneiss, granite, or porphyry. Slate, the most common bar birdstone material is rarely seen in bust birdstones of any kind unless it is unusual or exotic.

One of the minority types of bust birdstones is what I call the massive variety. It has a large head which looks more like a frog than any other animal. The eyes are buttons or cylinders and never expanded or toadstool-like. Even though many of them are finely finished, they do not portray the delicacy seen in the more common varieties. Drilling is the exception rather than the rule. Some have grooves cut across the upper surface of the base to facilitate attachment. This grooving is quite similar to that found in the rarest bust birdstones—those made of pipestone which are in a class of their own and to which the massive style is related.

Some collectors call the massive style unfinished examples. While this may apply in some instances, the massive examples are always completely finished. They also differ somewhat in materials since some are made from sandstone or even limestone. Also found is gneiss, granite and quartzite.

Fig. 1 shows two massive bust birdstones and one unfinished specimen of the more delicate style. Top is made of sandstone and is grooved front and rear for attachment. Its eyes are like rounded buttons. It was found on the Weirs Farm, Seneca County, Ohio. Center is an almost identical example made of gneiss. The eyes are like short cylinders. It was found in Morrow County, Ohio. Bottom is an unfinished specimen of the more delicate style. It is not highly polished and is obviously unfinished and made of yellow granite. It is from Hardin County.

Center and bottom are from the collection of Jim Hahn, Newark, Ohio—top Editor's collection.



Fig. 1 (Converse) Two massive bust birdstones and an unfinished example. Top to bottom, Seneca Co., Morrow Co., Hardin Co.



Fig. 3 (Converse) Oblique view of bust birdstones.

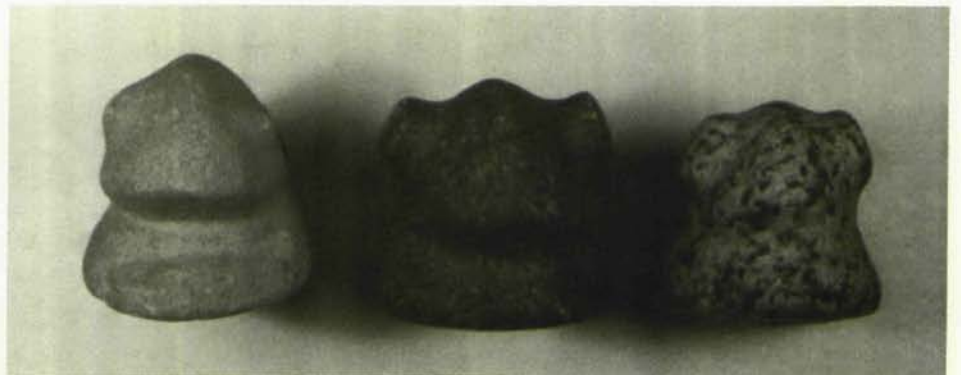


Fig. 2 (Converse) Front view of bust birdstones.

Gerding Receives Ohio Historic Preservation Office Award

COLUMBUS, Ohio—John Gerding, of Marengo, Ill., a construction supervisor for American Telephone & Telegraph Co.'s fiber optic cable routes in Ohio, was recently honored with a Preservation Merit Award by the Ohio Historic Preservation Office of the Ohio Historical Society for his innovative efforts in the preservation of archaeological resources.

Begun in 1983, the annual awards honor exceptional achievements in the preservation of Ohio prehistory, history, architecture, or culture, according to Dr. W. Ray Luce, state historic preservation officer, who presented the nine awards at the Ohio Historical Society's annual meeting in Columbus this September.

For the routes which he is supervising, Gerding is responsible for AT&T's compliance with environmental laws, including those pertaining to the preservation of archaeological resources. He organized a workshop at the AT&T regional office in Chicago to teach AT&T administrators about the importance of archaeological resources and the laws that protect them, and has hired video crews to document the phases of archaeological investigation that pertain to sites within the fiber optic cable right-of-way.

A survey of the construction right-of-way, conducted in compliance with Section 106 of the National Historic Pres-

ervation Act, located more than 300 previously unrecorded archaeological sites, including mounds, rockshelters, historic structural remnants and habitation sites. Three sites have been determined eligible for listing on the National Register of Historic Places.

Gerding works with the Ohio Historic Preservation Office to reduce the impact of construction on archaeological resources in the construction right-of-way, and to reroute fiber optic cables around important sites. When there is no feasible way to reroute the cables, the effects are mitigated through data recovery by professional archaeologists prior to construction.

Meeting Announcement

Midwest Archaeological Conference, October 13-15, 1989, Iowa City, Iowa. Hosted by Office of the State Archaeologist (OSA), The University of Iowa. Abstracts for symposia (and all symposium paper abstracts) due August 4, 1989; abstracts for contributed papers due September 8, 1989. For further information, please contact William Green or Stephen Lensink, OSA, Eastlawn, University of Iowa, Iowa City, IA 52242; 319/335-2389.

Back Cover

This double crescent bannerstone is from the collection of Earl and Gary Mumaw of Versailles, Ohio. As can be seen in the color plate, it is made of highly banded greenish/black and gray slate. An outstanding example of one of the rarest of all bannerstone forms, it is 5¼ inches wide and 5 inches long. Its provenience is given as Delaware County, Ohio.



OBJECT OF THE SOCIETY

The Archaeological Society of Ohio is organized to discover and conserve archaeological sites and material within the State of Ohio, to seek and promote a better understanding among students and collectors of archaeological material, professional and non-professional, including individuals, museums, and institutions of learning, and to disseminate knowledge on the subject of archaeology. Membership in this society shall be open to any person of good character interested in archaeology or the collecting of American Indian artifacts, upon acceptance of written application and payment of dues.