PREHISTORIC COPPER ARTIFACT JOURNAL

VOL. 4 - NO. 2

DECEMBER 2008

GREAT LAKES COPPER RESEARCH
AMERICAS AND THE WORLD

MISSION STATEMENT

Our research mission is to enhance the reservoir of knowledge and understanding about man's early use of copper. We wish to know all we can about his activities and belief systems involving ancient prospecting, mining, trading, crafting and use of copper, firstly in the Great Lakes area, secondly in the Americas, and finally in the world.

In pursuit of this knowledge, Great Lakes Copper Research will:

1. Collect and archive historical documents and research material relating to prehistoric use of copper.
2. Furnish library services and materials pertaining to the early utilization of copper.
3. Equip a museum for public display of copper and copper related artifacts to increase the awareness of, knowledge about and interest in man's early use of copper.
4. Advance the study of early copper and related subject matters by providing facilities and scholarships to students for the study of copper related topics. Make grants to universities and individuals to complete carbon testing and other costly procedures relating to the expansion of knowledge about early copper use.
5. Train and provide public speakers on the subjects of early copper mining, manufacturing and use.
6. Analyze and authenticate copper artifacts for non-profit institutions (without fee).
7. Engage in research and all other tasks to advance knowledge about the early use of copper in man's history.

We believe the study of primeval copper use will significantly increase our understanding of early human development.

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GREAT LAKES COPPER RESEARCH
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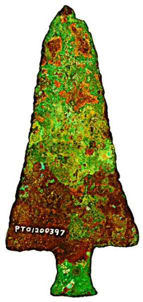

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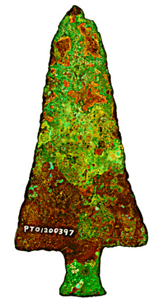


Michigan Mandrill Old Copper Complex

Great Lakes Copper Research

Great Lakes Copper Research is a nonprofit organization established to collect information about prehistoric prospecting, mining, crafting, trading and use of copper; first, in the Great Lakes Area, second, in the American, and finally, in the world. Although we use and value the literature, our research is base primarily upon a through examination and analysis of copper artifacts.

As our goal is the advancement of knowledge, we seek no profit. The fruit of our labor is free. We have nothing for sale.

We encourage input from others with parallel interest and a thirst for knowledge. Time, talent and finical resources are important to us, but our collection of data is based above all else, on weighing, measuring, and analyzing copper artifacts. Long term or permanent access to copper artifacts is, therefore, indispensable to our success.

Our Copper Journal

The purpose of our copper journal is to share knowledge. It, like the knowledge we labor for, is not for sale. What we publish in this journal is limited to what we believe to be true. What we believe to be true must be based on facts, but as the interpretation of facts is somewhat subjective in the social sciences, and is, therefore, always open to revision. We welcome new facts and the reinterpretation of old facts, even if doing so requires admitting we were wrong.

This Issue

In this issue, we have changed the name of our copper journal to the **Prehistoric Copper Artifact Journal.** The primary articles in this issue are summaries of comprehensive research on two copper specimens, the Socketed Triangulate and the Socketed Ovate.

Our next issue is slated to be a Handbook On Prehistoric Copper Projectile Point Typology. Our goal is to picture and summarize the characteristics of more than a dozen projectile points. Whereas, in this volume, we have presented you with more detail than most of you may want, in our Handbook on Projectile Point Typology, we will distill pertinent information into two or three pages (including drawings and photos). for each type, or variety of type,

Metric Versa Standard Units Of Measure

The facts are; most of the world, excluding the United States uses the metric system. The metric system is used in all scientific journals and professional publications here in United States. Most lay people in United States still use the standard units of measures.

Because (1) this journal is read primarily by lay people, (2) those professionals who read this journal understand the standard units of measurements, and (3) it is a burden for most of our readers to convert metric to standard (and they often failing to do so), we have chosen to use the standard units of measure.

An Open Mind Is A Dwelling Place For Wisdom

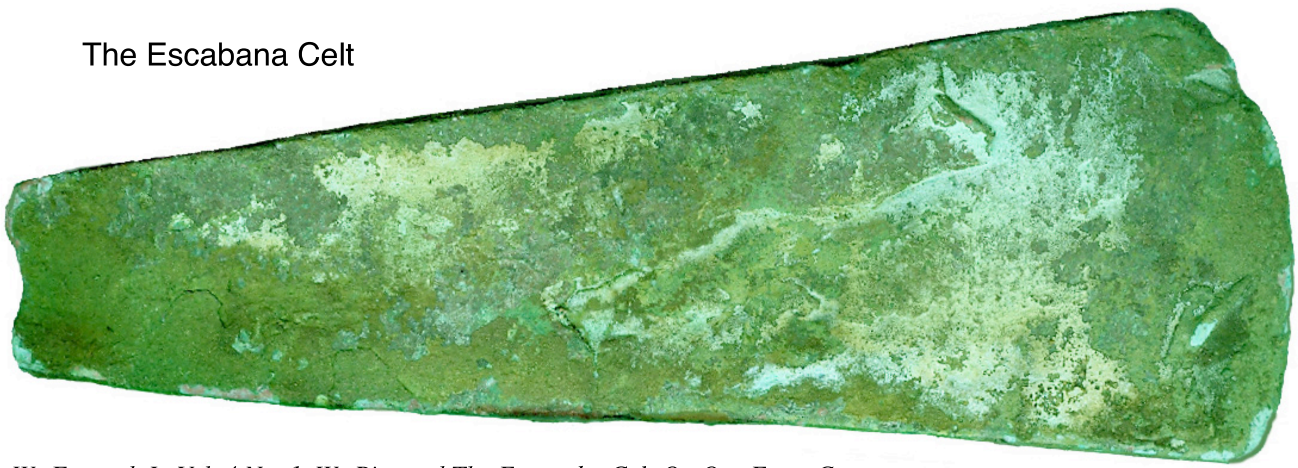
Our Scholarship Fund

Last year Great Lakes Research awarded a small scholarship to a student training to become an archaeologist at Grand Valley State University. This year we initiated a new scholarship fund and this time, we have a more specific three part goal. First, we plan to build the fund up to a modest $500.00. Second, when the scholarship fund reaches this point, we intend to select a candidate (student archaeologist) who will do his/her doctoral dissertation on prehistoric American Indian copper. Finally, we plan to to select a student archaeologist who has an open mind toward collectors, and will plan to work with collectors as a practicing archaeologist.

Ollie Anttila's recent contribution of $50.00 brought our scholarship fund up to $150.00. If you would like to associate yourself with Great Lakes Copper Research in this way, we will welcome your association and contribution, and send you a receipt.

Correction

The Escabana Celt



We Errored. In Vol. 4 No. 1, We Pictured The Escanaba Celt On Our Front Cover. Unfortunately, We Illustrated Two Views Of A Single Side. The Missing, Obverse side Is Shown Above. The Escanaba Celt Is 6 1/2 Inches Long And Weighs 12.7 Oz.

Cold Hammer Fusion

For a long time, I have believed ancient copper smiths knew the secret of fusing multiple pieces of copper together in order to create one bigger utility from two or more smaller pieces. Others have believed that ancient craftsmen first found the right sized piece of copper, then pounded what they needed form a single piece. Or, with no large pieces at hand, available smaller pieces dictated the size of the finished product.

The term fusion is not precise. It often implies melting two or more objects to the point of fluidity, at which time they flow together creating a single mass. Cold hammer fusion implies much less. Terms like a "fusion weld" or "lap weld" may be more appropriate. The term laminating is sometimes used. I have thought of no good definition for the term, hammer fusion.

Those who believe ancient copper smiths created each object from single pieces of copper will reject all such terms as definitions for a process, which doesn't exist. Joe Neubauer called me in

October and I brought the subject up to him. He has probably pounded more copper than anyone since the days of the prehistoric coppersmiths. He does not believe in cold hammer fusion.

I explained to Joe, that I once watched the deceased Jack Koopmans pound copper on a stone anvil in my family room. As he sat beside me, I witnessed the lap lines disappear under the light tapping of his stone hammer. Joe told me that they didn't disappear. If I used a magnifying glass, I would see them and they would separate again under pressure (use).

I believe in facts. I know of no one who has cold hammer fused two or more pieces of copper together. Joe says it can't be done. On the other hand, we often find 50 or more very small to tiny, pounded pieces of copper, 1/10 of an oz or less (some too small for pounding into the smallest of beads) with each completed piece of copper. Many are obviously not scraps.

Many mysteries remain for students of copper to sort out. I am no longer as sure as I once was about Cold Hammer fusion. The best I can do, is respect the facts and keep an open mind.

Another Look At Worm Tracks & What If I'm Wrong?

In our last copper journal, Vol. 4 No. 1: 7-10, I stated "we believe worm tracks are seldom if ever found on copper artifacts much less than 2,000 years old." In response to that article, some students of copper have shown me pictures of copper implements they believe to be from middle Woodland sites. And some of these pieces show clear and distinct worm tracks. But, many of these specimens look to me like Old Copper Culture Complex implements.

Mason (1981: 188) identifies a core group of copper artifacts as distinctive to the Old Copper Culture Complex. These include: (1) Tang socketed (Socketed Triangulate & Socketed Ovate), (2) multiple notched (Serrated Point), (3) leaf-shaped with rat-tail tangs (Oval Rat-Tail and Long Rat Tail), (4) the Ace of Spades, (5) tanged socketed asymmetrical knives, (6) spuds, and (7) crescents.

Steinbring (1970: 60) states types 1A (Socketed Triangulate) 1B (Socketed Ovate) and 1C (Oval Rat Tail) may be regarded as Old Copper (Culture). And no one in the literature has argued against designating these several artifacts specimens as Old Copper Culture complex types.

At least some examples of all the artifacts identified as Old Copper Culture by Mason, Steinbring and others exhibit a worm track erosion pattern. Some types, the Socketed Triangulate, for example, almost all exhibit a worm track erosion pattern.

Although I have never seen prehistoric copper specimens clearly dated to the A.D era exhibit a worm track erosion pattern, I must admit, (1) I have not seen everything and (2) not all specimens identified as Old Copper Culture Complex have been positively dated to the B.C. era.

Although I have seen no proof that Old Copper Culture Types were made very long after the dates assigned to the Old Copper Culture Complex (that is, after 1000 B.C., even into the A.D. era), I must also admit that it is conceivable. If true, it is more plausible north of Lake Superior. Copper cultures in Michigan, Wisconsin, and Minnesota may have followed large animals adapted to cold weather, which receded north into Canada with the melting of glaciers, as they did in Paleo times. In this manner, remnants of this migration to Canada may have survived the decline of the Old Copper Culture Complex in more southern areas.

We believe the worm track erosion pattern (one of several erosion patterns) is initiated by an interaction between the following: (1) chemical and physical molecular structure (properties) of copper, (2) the way craftsmen selected, heated and pounded (worked) copper and (3) the interaction between copper and the elements found in its environmental and, (4) time.

If this formula is correct, it is possible (although we have no proof) that variations of (1) the properties of copper, (2) craftsmanship and (3) environmental conditions may add or subtract, to some extent, the time required for a worm track erosion pattern to materialize on the surface of prehistoric American Indian copper artifacts..

Finally, it is possible that a specific amount of time is required for worm tracks to emerge, but that the time is shorter than we have believed. If for example the normal time period for worm tracks (to grow and materialize) is 1,500 years, we may find copper artifacts created perhaps 7,000 years ago with 5,500 year-old worm tracks.

Following this line of thought, late remnants of the Old Copper Culture Complex in Canada or in other places may have pounded Old Copper Culture Complex type specimens in 500 A.D. And if they did so, we find these artifacts today with a worm track erosion pattern much like those crafted thousands of years earlier in Michigan and Wisconsin.

I have not concluded that any of these scenarios are correct. They all have their rough edges, but we can use each as a separate working hypothesis while continuing to gather data and knock off some of the rough edges. Eventually truth will prevail.

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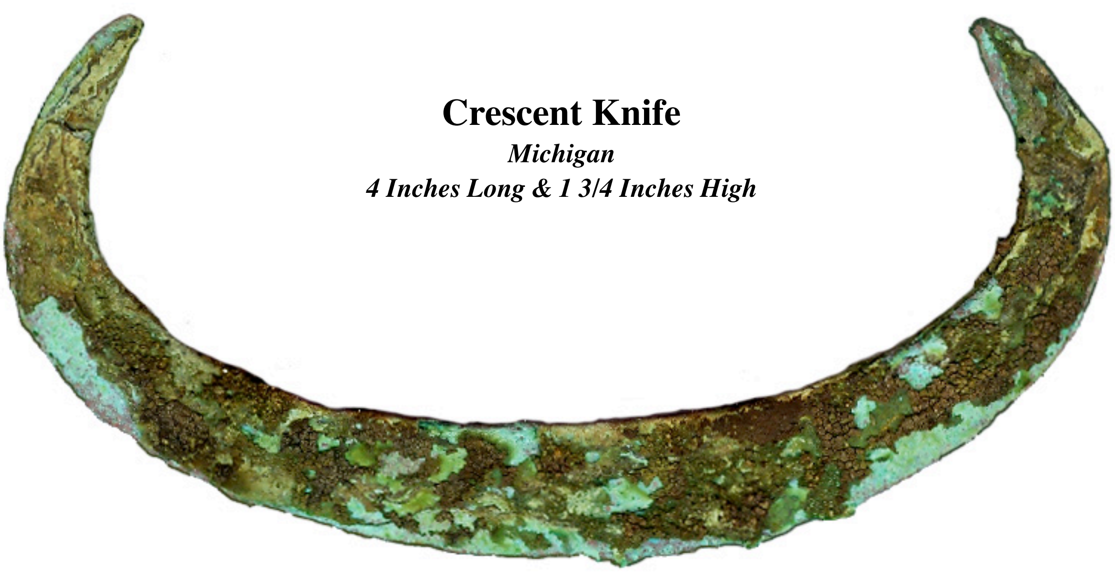


Crescent Knife

Michigan

4 Inches Long & 1 3/4 Inches High

The History, Typology and Nomenclature For Socketed Triangulate Projectile Points

Wisconsin
7 5/8" Long

Fig. 1

Fig. 2

Wisconsin
8 1/2" Long

Fig. 3

Michigan
8 1/4 " Long

The Socketed Triangulate

Introduction And History

The Socketed Triangulate takes its name from its motif. In both outline and composition, it is constructed entirely from triangles, partial triangles and triangle-like parts. It is, therefore, composed of straight lines, sharp angles and flat surfaces. Time and oxidation has smoothed over some of these characteristic and early coppersmiths were not always as rigid as the name and description of this point may suggest.

Several remarkable characteristics compel us to recognize the Triangulate as an outstanding and unusual specimen. Early on Charles E. Brown (1904: 77-78) described this point (Ridged Socketed) as beautiful and unsurpassed in the degree of skill required on the part of aboriginal craftsmen. West (1928: 73) mentions its strength and ornamentation, while Flaskerd (1940: 39) found the Triangulate in Minnesota and called them "Straight Back Points." Wittry (1950: 15) noted the Triangulates' straight lines, flat surfaces and angles, describing it with terms like, "elongated triangular blade," "acute angle," and "(its) socket is angular." He named this point, (1A Socketed, Ridged Back Bayonet Back Projectile Point. As no one could possibly remember a name this long, they were henceforth known simply as 1A.

One might expect specimens of such beauty and strength, those based on an "unsurpassed" technology, to be one of the younger artifacts, based on more recent technical advances, and perhaps, uncommonly rare. But unexpectedly, this is not true. They are among the most prolific of all copper artifact types found in Wisconsin. Brown (1904: 77-78) found that outside of awls, fishhooks and conical points, this type was by far the most common copper implement occurring in Wisconsin. He described them as having been found in the thousands, from all over Wisconsin and as far east as New England, as far west as Missouri, as far north as Canada and as far south as the Gulf.

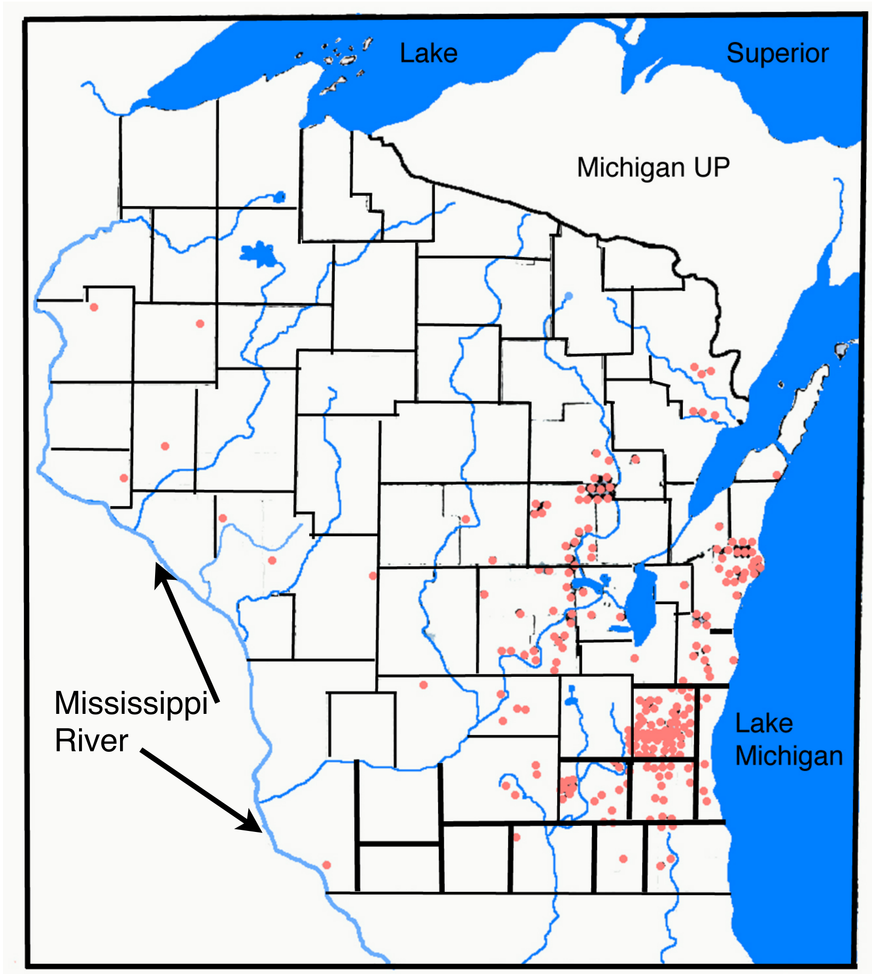
Wittry (1950: 43) found the Socketed triangulate distributed throughout Wisconsin, in more than 40 counties. See Distribution map on the following page. Later in the 1950's a cemetery (the Osceola Site) was discovered along the banks of the Mississippi in Grant county. At least one Socketed Ovate was recovered and the site was carbon tested to 1,500 B.C. In the last 15 to 20 years a large number of Socketed Triangulates have been recovered in Vilas county, Wisconsin, near the boarder with Michigan's Upper Peninsula. Others are found in Grant county. Neither Grant nor Vilas counties had previously produced Triangulates and are not included in Wittry's distribution study. Socketed Triangulates have also been found in New York, South Dakota and other states.

Triangulates range in length form roughly 3-14". Every one observed by this student of copper, exhibited some form of worm track erosion pattern. This is another unusual characteristic. Many Old Copper Complex specimens show worm tracks, as do some later examples, but it is exceptional that every sample of a type should show some degree of a worm track erosion pattern.

This exception is especially remarkable when we consider the great geographic range, north and south, east and west in which the Triangulates were exposed to weather, soil conditions, and other environmental factors. This is true, even if the range is not so great as thought by Brown. It must be noted, too, that although we find some oxidation among our Triangulate samples, we do not find as many in advanced stages of oxidization as we do in sampling other types of copper artifacts.

We don't know how old the Socketed Triangulate is, how long ago the first ones were crafted, or for how long coppersmiths continued to pound them out. The fact that they all show worm tracks may speak to both, their age and quality of workmanship. The fact that so many are found in relatively good conditions speaks more about their creators talents than it does of their age.

Wittry's 1950 Distribution Map (1) Showing
The Locations of Socketed Triangulate Finds By County In Wisconsin



Each red dot indicates a Socketed Triangulate (Wittry's 1A) find prior to 1950

Mason (1981: 188) identified a core group of copper artifacts as distinctive to the Old Copper Complex. These included: (1) Tang socketed (Socketed Triangulate & Socketed Ovate), (2) multiple notched (Serrated Point), (3) leaf-shaped points with rat-tail tangs (Oval Rat-Tail and Long Rat Tail), (4) the Ace of Spades, (5) tanged socketed asymmetrical knives, (6) spuds, and (7) crescents. Steinbring (1970: 60) stated "while types 1A (Socketed Triangulate) 1B (Socketed Ovate) and 1C (Oval Rat Tail) may be regarded as Old Copper (Culture) …"

The Socketed Triangulate has, thus, long been associated with the Old Copper Complex. And the OCC has been dated to 4,000 to 1,000 B.C. (Pleger 2000: 1). More recently, Copper-working dates have been pushed back even further. William Reardon (Anttila 2006: 189) found two conical points with remnants from wooden shafts remaining in their sockets. They were dated in carbon 14 tests at two radiocarbon laboratories, the Wisconsin Radiocarbon Laboratory, Madison, Wisconsin and the Beta Analytic Radiocarbon Dating Laboratory in Miami, Florida. The Wisconsin testing dated their sample at 7,305 +/- years B.P., while the Florida Lab dated their sample at 7,690 +/- years B.P.

At site 20KE20 in the Keweenaw Peninsula, Michigan, a hammered copper fragment was recovered from a hearth-like feature (Martin, 1999: 143-144). A piece of charcoal from the same hearth-like feature yielded a radiocarbon date of 7,800+/- 350 B.P. Steinbring (Hlady 1970: 48) believes "... it would appear that at a time when Late Paleo-Indians artifact styles were not yet extinct, some human populations in the Upper Great Lakes regions were discovering the use of copper."

Fig. 4

Socketed Triangulate
From Steuben Co. New York

In discussing the Agate Basin–like McCreary points, Steinbring (1990: 56:) concludes, "Thus, from a complex set of inter-related data, this synthesis favors the placement of the McCrearys in western Manitoba at between 8500 and 8000 years ago. If subsequent research bears out these speculations, it will be shown that the North American interior saw the utilization of metal (copper) 500 years before the initiation of such a technology in the Old World."

The McCreary is a Paleo-Indian-like copper point. One would think that a fairly simple tangless lanceolate point must have arrived on the scene long before the very formal and sophisticated Socketed Triangulate. Still, Anttila (2008: personal eMails) reports that at least 2 known triangulates have been recovered from the eastern shoreline of ancient glacial Lake Agassiz, in north-western Minnesota, suggesting an age in relation to that shoreline, ca. 8000 years ago.

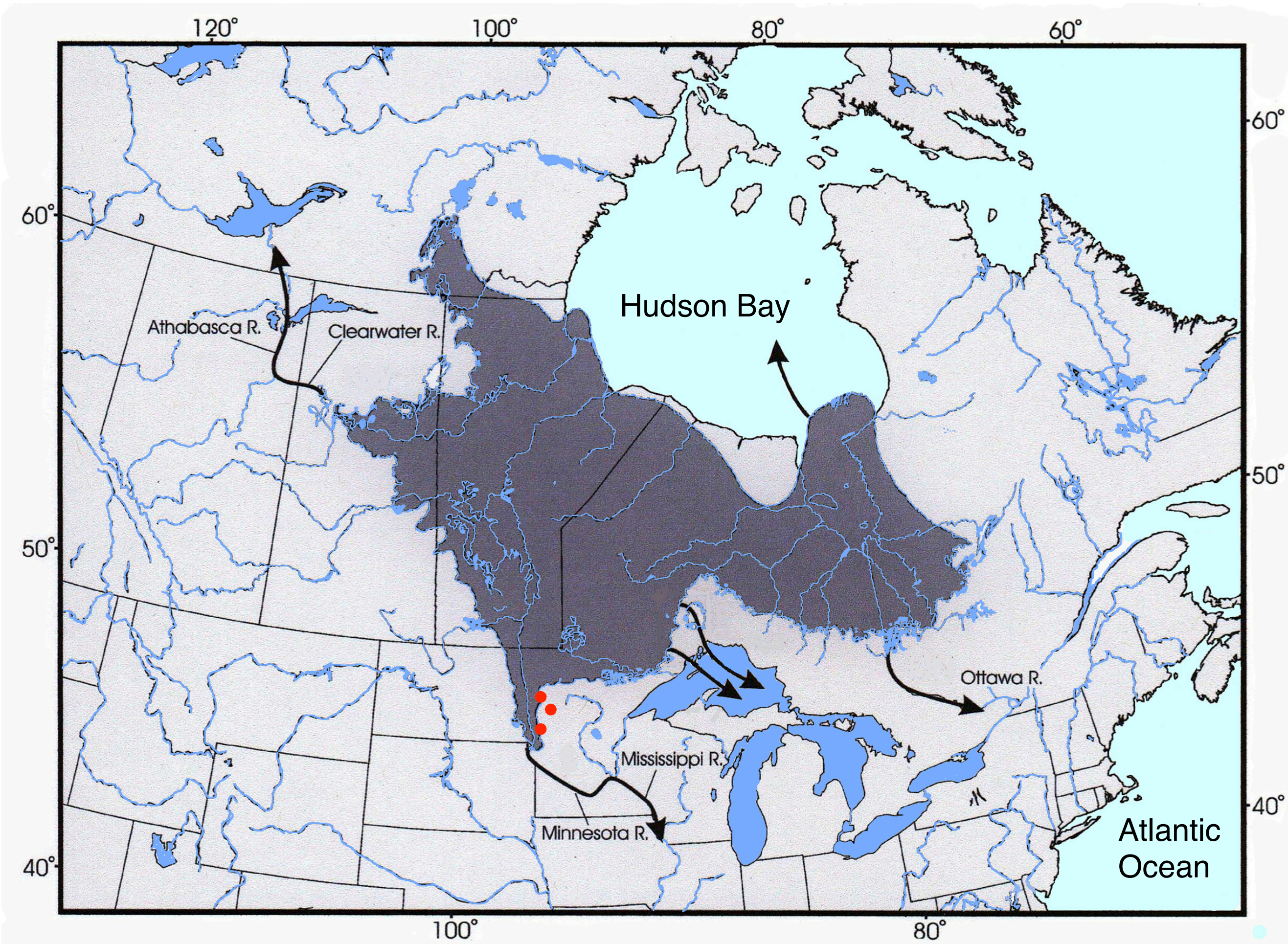
Peder Hornseth found the first of these two Socketed Triangulates (Fig. 5) with the longer socket. He discovered it while clearing stumps from logging land between 1905 and 1915, along Red Lake River, in Marshall County near Thief River Falls. W. H. Jensen found the second Triangulate (Fig. 7) with shorter socket. He recovered it before 1950, a little further south, near Fergus Falls and the Ottertrail River. Both Socketed Triangulates are now curated by Tom Amble, Past president of the Central States Archaeological Society.

A third Triangulate (Fig. 6) was found in the same general area during the 1800s, near Mud Lake in the Mud Lake Agassiz Refuge, Marshall Co. This specimen is now curated by Great Lakes Copper Research. It would not be inappropriate to suggest that being far more prolific in Wisconsin and Wisconsin being closer to the primary source of raw copper, that the Socketed Triangulate was probably produced in Wisconsin even earlier than in Minnesota.

We can not be sure that Steinbring's (8,000 year age) for the McCreary is correct, or that the three Triangulates found on the ancient shoreline of glacial Lake Agassiz are actually 8,000 years old. Brown (1904: 77-78) observed some Triangulates with parts of wooden shafts still preserved by copper salts. Someday radiocarbon tests will help us arrange these and other specimens in their sequential temporal order. When that occurs, we may be surprised. The Paleo-like McCreary and similar Paleo-like copper points found around the Great Lakes basin may be older than than guessed by Steinbring, and the Socketed Triangulates may indeed have been crafted 8,000 years and more ago.

On the other hand, we may find that the McCreary and other copper Paleo-like points are no older than other OCC specimens. And we may find the Triangulate much younger than we now guess. Until these and other specimens are tested, we must rely on the data at hand, and this data suggest these two point types, the McCreary and the Triangulate are from the Early Archaic era, if not even older, while the the Paleo-like McCreary is probably older than the Socketed Triangulate.

Glacial Lake Agassiz Map (2)



← Black arrows indicate over flow routs.

▪ Red Dots Indicate locations along the shores of Ancient Glacial Lake Agassiz where 3 Copper Socketed Triangulate points have been recovered over the past 150 years or so.

Lake Agassiz

Glacial Lake Agassiz was formed roughly 12,000 years ago at the end of the Pleistocene Epoch. It began to recede north around 10,000 years ago, but remained in some part up until 8,000 years before the present. In the north, much of its bulk eventually drained into the Hudson Bay, while its southern portions drained into the Great Lakes, and through the Mississippi Valley into the Gulf of Mexico.

Lake Agassiz was in its prime a huge body of water. It exceeded the area today covered by the five Great Lakes plus the much larger Hudson Bay. It covered parts of Minnesota, North Dakota in the US and most of Manitoba and Ontario and parts of the NorthWest Territories in Canada.

Clovis people hunted along the shores of Glacial Lake Agassiz between 12,000 and 10,000 years ago (Manitoba Archaeological Society 1998) as proved by the recovery of Clovis points in Manitoba. And it was also in Manitoba that Steinbring discovered the now famous McCreary copper lanceolate shaped spear point.

Three Socketed Triangulate From The Shores Of Ancient Lake Agassiz

Fig. 5

Fig. 6

Fig. 7

Three specimens, figures 5, 6, and 7, all Socketed Triangulates, all roughly 6 inches long, and all 3 recovered many years ago from the ancient shores of glacial Lake Agassiz. Figure 5 and 7 are curated by Tom Amble. Middle specimen is curated by Great Lakes Copper Research.

The Socketed Triangulate

Parts Divisions

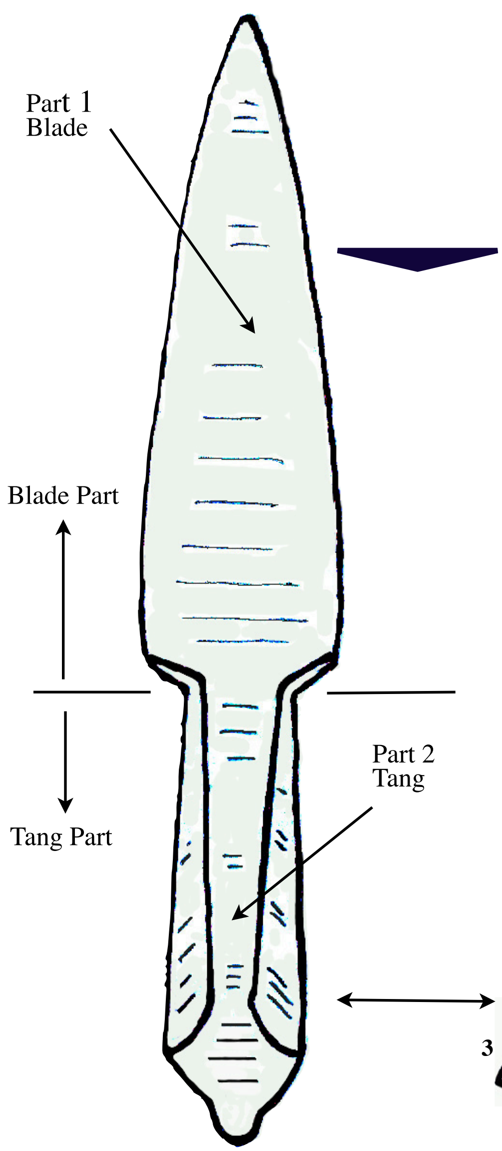


Fig. 8

Segment Divisions, Front

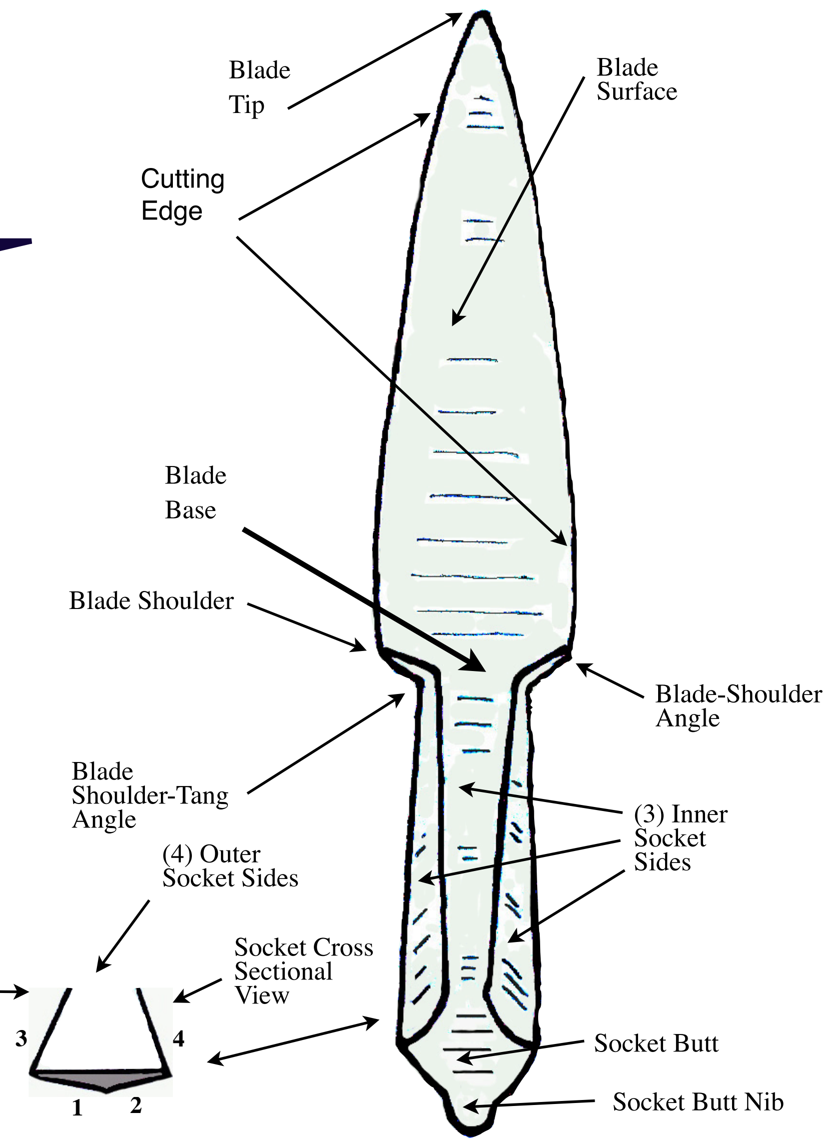


Fig. 9

Segment Divisions, Back

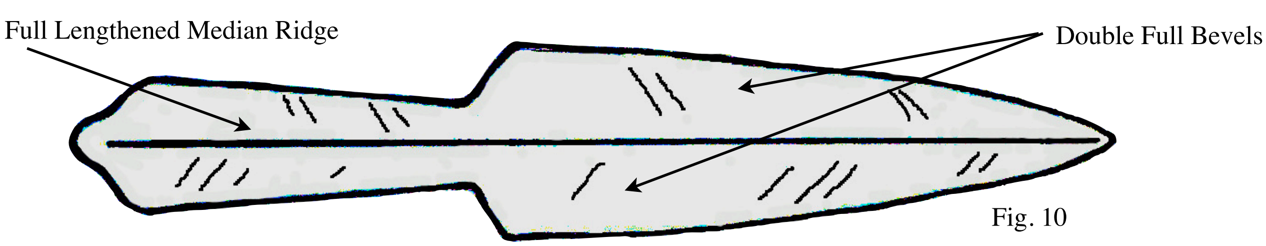


Fig. 10

Traits & Characteristics
Socketed Triangulate Point

Socketed Triangulate Blade Traits And Characteristics

- Point tip is sharp, long and narrow.
- The blade is long and triangular.
- Blade edges are straight to convex.
- Median ridge runs full length of its back, making it straight & rigged.
- Double full bevel between median ridge and cutting edge.
- Blade's front exhibits a plano-surface.
- Cutting edges are unbeveled.
- Blade shoulders are sharp and angled.
- Many socket edges extent onto the blade base.
- Nearly all exhibit a worm track erosion pattern.
- Most exhibit a nobel patina.

Exceptions

- One variety has round shoulders.
- One variety has a step
- A few have a rounded point tip.
- One variety has a convex front blade surface.
- One: raised blade-socket joints. Many do not.
- convex surface, no median ridge

Fig.11

Michigan Provenance

Socketed Triangulate Socket Traits And Characteristics

- Sockets interiors are square-like to angular-like in cross section.
- Median ridge extends from blade tip socket nib.
- The two interior socket sides are perpendicular to the socket bottom.
- The inside socket bottom is flat.
- The interior has 3 surfaces, the bottom and the right and left sides.
- The socket exterior has 4 surfaces, 2 bevels formed by the median ridge and the right and left sides.
- The bottom socket butt protrudes a quarter inch or so forming a triangular-like nib or stud.

Exceptions

- Nibs sometimes have a secondary smaller triangular nib extensions.
- Some specimens begin their sockets after the blade. Other socket sides grow out of the blade base.
- Some socket interior bottoms were rounded in tightening the socket around a wooden shaft.
- Some few socket show a a

Fig. 11 Above, Socketed Triangulate

Fig. 11 (above), from Michigan, is 5 1/32 inches long. This is an unusual specimen as its back side is 100 percent covered with a naturally flattened worm track erosion pattern.

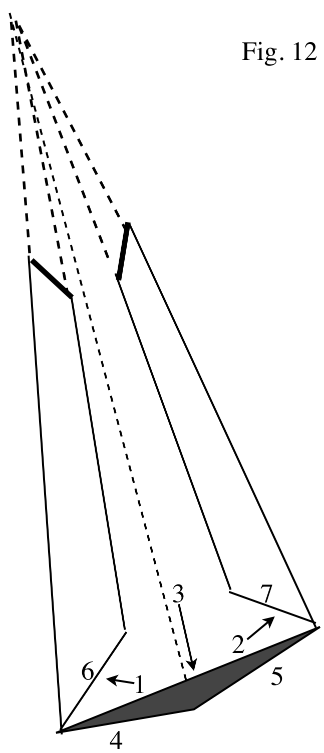
Socketed Triangulate

The Oxford English Dictionary defines triangulate as having to do with triangles, triangular, the made up of, or composition of triangles. No other word fits this projectile point so well. Its blade is triangular in shape, the front of the blade is a single triangle, while its back, split by a median ridge, is composed of two triangles. Because the face of the blade is flat, while the back is divided by a median ridge, a cross sectional view of the blade is a perfect triangle. In profile, both the blade and the overall projectile point are triangles.

The socket is a set of triangular parts. If the lines which form the 7 flanges or socket sides (4 outside and 3 inside) were extended, they would all meet, forming 7 triangles (Fig 12, 1-7). The socket is unique. It has a flat triangular extension, a nib, tail, or stud, and some of these nibs are perfect triangles, while others are only triangular-like and some few may be more “D” shaped Figs. (Figs. 13, 14 & 15) . Some nibs have a triangular-like extension to the extension or nib (Fig 13). A cross section of the blade is a triangle and a cross section of the socket is a set of two triangles (Fig. 16).

Unlike other projectile point, the Socketed Triangulate is fabricated from at least 16 triangles or triangular-like parts and it is fabricated almost entirely from triangles or parts of triangles. It is therefore a complex set of straight lines, flat surfaces and sharp angles. Curves are not always absent, but among so many sharp angles, straight lines and flat surfaces, curves appear purposely limited, if not excluded.

Fig. 12



View of Socket sides & angles & cross sectional view of blade. Nos. 1-7 indicate 7 angles and 7 socket sides, 3 inside & 4 outside.

Some think that nibs (studs) were engineered to bend up and fit into a slit in the wooden shaft. It would have thus helped secure the point to the shaft and prevented it from slipping backward upon impact, or pulling off the shaft when jerked out of prey. If so, it would have supplemented the step often found at the end of the socket, next to the base of the point. The step prevented the shaft from sliding forward upon impact. And steps are sometimes present while the stud or nib is never missing.

We cannot overlook the fact that the strange triangular-like stud or nib is positioned at the the base, butt, or tail of the socket, a place most distant from the point tip. It is, therefore, pointed on both ends. We cannot overlook the fact, either, that the nib is positioned as the tail on an object of flight, a projectile point. Finally, we cannot ignore the similarities in shape, proportion and position of the nib in relationship to anatomical tails of birds.

3 Nib Examples

Fig 13

Fig 14

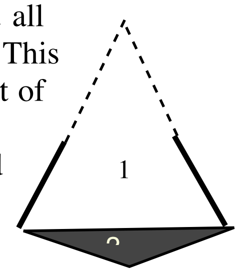
Fig 15

We think of bird’s tails as feathers, but tail feathers are attached to a physical maneuverable triangular appendix, which gives direction to flight. Birds, like airplanes are unable to fly without maneuverable tails.

Angles, straight lines and flat surfaces associated with the Triangulates may have served a spiritually symbolic purpose, as well as utilitarian functions. The nib may have served as a symbolic tail, guiding the point to its intended target. And if we could see the Socketed Triangulate in its days of pride, it may well have sported feathers attached to the nib. From a spiritual symbolic point of view, it is is also significant that one trait, the pin hole for rivets, a characteristic common on other socketed projectile points, is always missing on the Socketed Triangulate.

Other projectile point types prove the Socketed Triangulate's rigid design is not only unique, but unnecessary. Its exclusion of traits found on almost all other points may have more to do with spiritual symbolism than utility. This possibility does not exclude specific utilitarian purposes for its distinctive set of characteristics.

Fig. 16



2 triangles formed in a cross sectional view of the socket

Ancient man perceived his environment as dualistic, physical and spiritually symbolic. Although we can never crawl into his hoary head and see the world through those primitive eyes, we can examine available data and make educated guesses. If we wish to better understand ancient coppersmiths' craftsmanship, we cannot ignore data relating to the spiritual symbolic nature of his perceptions. It is also significant that the Socketed Triangulate excludes a trait often found in other socketed types, the pin hole characteristics, used for rivet insertion.

The next copper projectile point subjected to our analysis, the Socketed Ovate, may have functioned nearly as efficiently for may tasks performed by the Socketed Triangulate, yet it exhibits a whole different set of traits and characteristics, especially those excluded in engineering and crafting the Socketed Triangulate. A study of the companion Socketed Ovate may help us better understand the Socketed Triangulate.

The Socketed Triangulate was obviously designed as a spear point for use in hunting and war. It would also have made an efficient dagger. And like all spear points, it could have doubled as a knife, but its median ridge and over all design precludes its candidacy for primary knife duty. Most other spear point types would have functioned better than the Socketed Triangulate as a knife.

In summary, the Socketed Triangulate is a long narrow, straight, rigged spear point made up of triangles and triangle-like parts. Its blade is thickened with a median ridge giving it a ridged back. All specimens sport a stud or nib at the base of their sockets. Sockets are made of rigged angles with 3 inner and 4 outer, socket sides while its point tip is long, narrow and sharp.

Statistical Analysis Socketed Triangulate

Twenty-seven Socketed Triangulates were considered in this analysis. Of this group, two curated by Tom Amble were not physically examined. The other 25 samples are curated by Great Lakes Copper Research and each specimen was examined with a magnifying glass, measured, weighed and compared to each other and to Socketed Triangulates pictured or sketched and described by Brown-1904, West-1928, Flaskerd-1940 and Wittry-1950. They were also compared to several hundred more Socketed Triangulates examined in private and museums collections.

In this analysis, I have chose 12 characteristics or traits for comparison and analysis. Two trait are the oldest erosion pattern and patina category exhibited by each. There are several erosion patterns and a number of patina categories. For research purposes we only record the erosion pattern and patina category perceive as the oldest exhibited on each specimen. We follow this procedure regardless of how faint or indistinct the chosen category, or pattern, is among other possibly more clear and distinct ones.

Statistical Data For The Socketed Triangulate

Inventory No.	Variety of Socketed Triangulate	Provenance	Overall Length (inch)	Blade L (inch)	Blade W (inch)	Blade Thick (inch)	Socket L (inch)	Socket W (inch)	Socket Thick (inch)	Erosion Pattern	Patina Category	Wt. Oz.
1994	Round S	La Crosse Co. WI	5.56	3.38	1.00	0.19	2.25	0.63	0.44	Worm Track	Enamel	1.9
208	Stepped	Rock River Co. WI	7.50	5.25	0.75	0.19	2.25	0.56	0.38	Worm Track	(G) Noble	2
901	Stepped & RS	WI	7.19	5.00	0.94	0.19	2.38	0.75	0.50	Worm Track	(G) Noble	3.6
210	Classic	Rock River. Co. WI	4.63	3.25	0.88	0.19	0.50	0.50	0.38	Worm Track	(G) Noble	1.1
215 (99) 72	Stepped	Winnebago Co. WI	6.00	3.63	1.31	0.25	2.25	0.44	0.50	Worm Track	(G) Noble	2.8
CO2010 (211)	Stepped	Rock River Co. WI	4.88	3.38	0.75	0.19	1.50	0.44	0.31	Worm Track	(G) Noble	1
CO202095 (212)	Classic	Grand Forks ND	5.00	3.00	0.88	0.19	1.44	0.63	0.44	Worm Track	(B) Noble	1.7
1250499	No MR CB	Manitowoc Co.W	8.50	6.38	1.06	0.25	2.19	0.44	0.38	Worm Tracks	C or W	4
C0225096 (109)	Stepped	Montcalm Co. MI	5.06	3.00	1.06	0.19	2.00	0.69	0.50	Worm Track	(G) Noble	1.8
CO300797	Classic	Ottawa C. MI	5.75	2.75	0.88	0.19	3.00	0.63	0.19	Worm Track	(G) Noble	1.8
50360198	Classic	WI	8.13	5.88	1.13	0.19	2.19	0.63	0.63	Worm Track	(G) Noble	3.3
50340198	Classic	WI	7.13	5.75	1.13	0.19	1.75	0.63	0.50	Worm Track	(G) Noble	3.1
5150198	Classic	WI	4.88	1.75	0.69	0.19	2.25	0.53	0.63	Worm Track	(G) Noble	1.2
522498	RS	Unknown	7.25	4.88	1.00	0.25	2.19	0.44	0.50	Worm Track	(G) Noble	2.9
P2001298	RS	WI	7.56	5.13	0.97	0.19	2.50	0.69	0.31	Worm Track	(G) Noble	1.8
300699	Classic	Burnett Co. WI	6.25	3.88	1.19	0.25	2.25	0.69	0.44	Worm Track	(G) Noble	2.8
NM300104C	Classic	Marshall Co MN	6.00	4.13	1.00	0.19	1.88	0.44	0.56	Worm Track	Cleaned	2.4
5350198	Classic	Steuben Co. NY	4.44	2.88	1.00	0.19	1.63	0.63	0.44	Worm Track	Enamel	1.8
WI1500202	Classic	WI	4.88	2.88	1.00	0.19	2.00	0.63	0.25	Worm Track	(G) Noble	1.4
CO170297	Classic	WI	4.25	2.88	0.63	0.13	1.25	0.44	0.25	Worm Track	(B) Noble	0.8
IL75194	RS	IL	5.56	3.56	0.63	0.13	2.13	0.56	0.25	Worm Track	(G) Noble	1.1
MI80596	RS	MI	4.06	2.63	0.56	0.13	1.63	0.56	0.56	Worm Track	(g) Noble	0.7
X050795	RS	Unknown	4.25	0.75	0.75	0.19	1.50	0.31	0.25	Worm Track	(G) Noble	0.8
WI50198	Classic	WI	2.25	1.50	0.75	0.19	0.75	0.56	0.38	Worm Track	(G) Noble	0.5
	Classic	MI Al Co.	3.50	2.06	0.81	0.19	1.38	0.50	0.38	Worm Track	(G) Noble	0.8
Averages As	**Decimals**		5.62	3.58	0.91	0.19	1.88	0.56	0.41			1.88
Averages As	**Fractions**		5 10/16	3 9/16	1	3/16	1 7/8	9/16	7/16			

S = Shoulders RS= Round Shoulders MR= Median Ridge CB= Convex Blade surface Wt. = Weight (B)= Black (G)= Green

Similarly, measurements of length, width and thickness are taken at the longest, widest and thickest points on each specimen. Symbols and abbreviations used in headings and cells are defined below the chart. Averages are shown at the bottom of each column, both in decimal points and in Fractions. Measurements are in inches and ounces as these are the terms best understood by most of our North American readers,

Socketed Triangulate Data Analysis

Of the 12 attributes selected to categorize, measure, record, compare and analyze, three stands out. These 3 attributes are: (1) patination category, (2) erosion pattern, and (3) Blade thickness measurements.

Blade thickness measurements are very objective, but both erosion pattern and patina category attributes are somewhat subjective. Patination is even more subjective than erosion patterns. A discussion follows on each of the three attributes selected for analysis in this study, patina, erosion patterns and measurements.

Patination

After examining thousands of artifacts, we have narrowly and distinctively defined patina as an addition to the surface of copper. Patina forms as, (1) a coating of corrosion (oxidation), and (2) an encrusting of other elements. Nearly all patina is a combination of both corrosion (oxidation) and encrustation.

We have further divided the patina observed on prehistoric copper artifacts into 9 somewhat distinct and specifically defined categories (Spohn, 2007: 14-16). The first category is simple tarnish, the second, coloration. Other categories include green oxidizes, calcium patination, residuum patination, nodular patination, crusted patination, noble patination and enamel patination.

We have also concluded that the noble and enamel patination categories are the oldest. Most prehistoric copper artifacts exhibit two or more patination categories. For the purpose of this study, we make note of the patination category we hypothesize took the longest to develop. We recognize that under comparable opposites in extreme environmental conditions, the ages of categories might be reversed. Thus, a specimen exhibiting the patination category recognized as the oldest, the one we hypnotize required the longest time to develop under normal circumstances, may be younger than another specimen exhibiting a patina category recognized as younger.

Our working hypothesis is; in similar environmental conditions, a specimen with the older recognized patination category is older than a specimen, which exhibits a younger patination category. It is significant, therefore, that out of 25 samples found in several different counties in

Patination

Patination Category	Number of samples
Noble	21
Enamel	2
Cleaned	2

N = 25

Wisconsin, 3 counties in Michigan and one specimen each from Minnesota, Illinois, New York and South Dakota, 21 samples exhibit a noble patina and 2 exhibit an enamel patina. The other 2 were cleaned, or they too, might show one of the two oldest categories of patination.

Erosion Patterns

Whereas patina adds to the surface of copper, oxidation subtracts from the total copper mass of a specimen. From the first day copper is exposed to oxygen, copper ions began to migrate. Over time copper may lose nearly all of its electrons. Environmental conditions determine the time needed for copper to move through the following stages of oxidation: tarnish, pitted, scarring, disfiguring, and finally consuming (Spohn 2007: 36-37). As copper electrons egress, they leave an erosion pattern on the surface of copper. Erosion patterns are defined as: Erosion patterns are the scars left on the surface of prehistoric copper artifacts by electrons escaping over time.

Erosion patterns may be regular, recognized and categorized, or they may be irregular, haphazard and difficult to categorize. Often repeated and easily categorized erosion patterns occur on pounded copper. Irregular, haphazard and unpredictable erosion patterns are almost always found on unpounded geological specimens. There are some few exceptions (Spohn 2007: 38-40).

Erosion patterns include: pitted, mushroom, plateau, chasm, pre-worm track, worm track, inverse worm track and haphazard. Once copper is pounded, the laws of nature dictate the erosion pattern phenomena. Chemistry is the engineer and nature the artist.

Pounding and annealing predisposes copper to egress in visible designs called erosion patterns. Time is required for copper electrons to migrate, but the electro magnetic properties of soil,

Erosion Patterns

Erosion Pattern	Numbers
Worm Track	25

N = 25

different from environment to environment, probably effects the time required. Although the migrations of copper ions can be caused very quickly in the laboratory, we believe nature requires at least one to two millennium for worm tracks to appear.

We hypothesize that prehistoric copper artifacts lose copper electrons over time, and that erosion patterns like the pitted and mushroom patterns are not as old as the worm track pattern. If this is true, we will find two other conditions true. (1) Many prehistoric copper artifacts recognized as Old Copper Culture Complex will show worm tracks. (2) Native copper pounded by Indians in contact periods will never show worm tracks, and at most they will exhibit a pitted erosion pattern.

If our hypothesis is true, we can also predict more. Cast and only lightly pounded Old World prehistoric copper, for example, will show immature worm tracks, or none at all. And, Archaic American Indian copper artifacts will nearly all show worm tracks. If Socketed Triangulates are early OCC, we would expect most specimens to exhibit some form of a worm track erosion pattern.

We find it very significant, therefore, that all 25 of our Socketed triangulate samples show some form of a worm track erosion pattern. We suggest that those exhibiting a bold worm track erosion pattern spread over much of the specimen surface may be older than samples exhibiting a few very immature worm tracks.

Socketed Triangulate Blade Base Measurements

Whereas Patina category and erosion pattern attributes are somewhat subjective, blade base measurement is an objective value. It is very surprising and significant that the blade base measurements for the 25 samples were so close in value and that 18 out of 25 samples were an exact value, (.19 or 3/16) of an inch in thickness. It is even more surprising when we consider (a) age, (b)

Blade Base Thickness

Thickness	Number
.13 or 1/8”	3
.19 or 3/16”	18
.25 or 1/4”	4

N = 25

Overall Projectile Length

Projectile Length	Length In Inches
Longest Length	8.5 or 8 1/2”
Shortest Length	.75 or 3/4”
Average	3.58 or 3 9/16”

N = 25

Projectile Weight

Projectile Point	Weight In Ounces
Heaviest Projectile	4.0 or 4
Lightest Projectile	.5 or 1/2
Average	1.88 oz

N = 25

amount of oxidation, (c) variation in over all projectile point length, (d) variation in blade length and (e) variation in weight.

The question arises, why would a 2.25” long Socketed Triangulate point and a and a 7.5” long point of the same type, nearly 3 and ½ times as long in length, both have the same blade base thickness. 3/16”? And why would a small Socketed Triangulate weighing only ½ oz have the same blade base thickness as a much larger (3.6 oz) weighing more than 7 times its weight? Why do all 25 Socketed Triangulates, ranging in overall length from 2 ¼” to 8 1/2” and in weight, from 1/2 oz. to 4 oz., all exhibit blade bases averaging 3/16” in thickness? And in addition to all 25 averaging 3/16” blade base thickness, why do 18 of the 25 samples have identical 3/16” blade base thickness?

Finally, we must ask, why is the classic Socketed Triangulate built around so many triangles and triangular parts (at least 16)? We hypothesize that these questions are all related and some or all of these questions may have a common answer. As the common denominator appears to be angles and the most common angle is the one found in a cross sectional view of the blade base, we must focus our attention in that area. First, however, we must answer another set of questions.

(1) Is it by chance or purpose that a point type is designed from 16 triangles?
(2) Is it chance or by design that 18 out of 25 samples from such widely diverse areas, crafted in diverse sizes and weights, perhaps over a period of hundreds, even thousands of year, all have the same blade base measurement?
(3) Is it by chance that 23 samples out of 25 show a noble patina?
(4) Is it by chance that all 25 samples exhibit a worm track erosion pattern?

It is statistically impossible to assign chance to the attributes: (1) composition of angles, (2) blade base measurements, (3) noble patina, and (4) worm track erosion pattern, all exhibited in the

Socketed Triangulate projectile point. The remaining option is design. But we can divide these 4 attributes into two groups.

The first group, patina and erosion patters may indicate age or a range of dates between which ancient craftsmen produced our 25 Socketed Triangulate samples. This leaves composition of angles and measurements, which we will assign to culture. We can combine the remaining two issues (composition of angles and measurements) we may ask a single question, what cultural values inspired the design of the Socketed Triangulate.

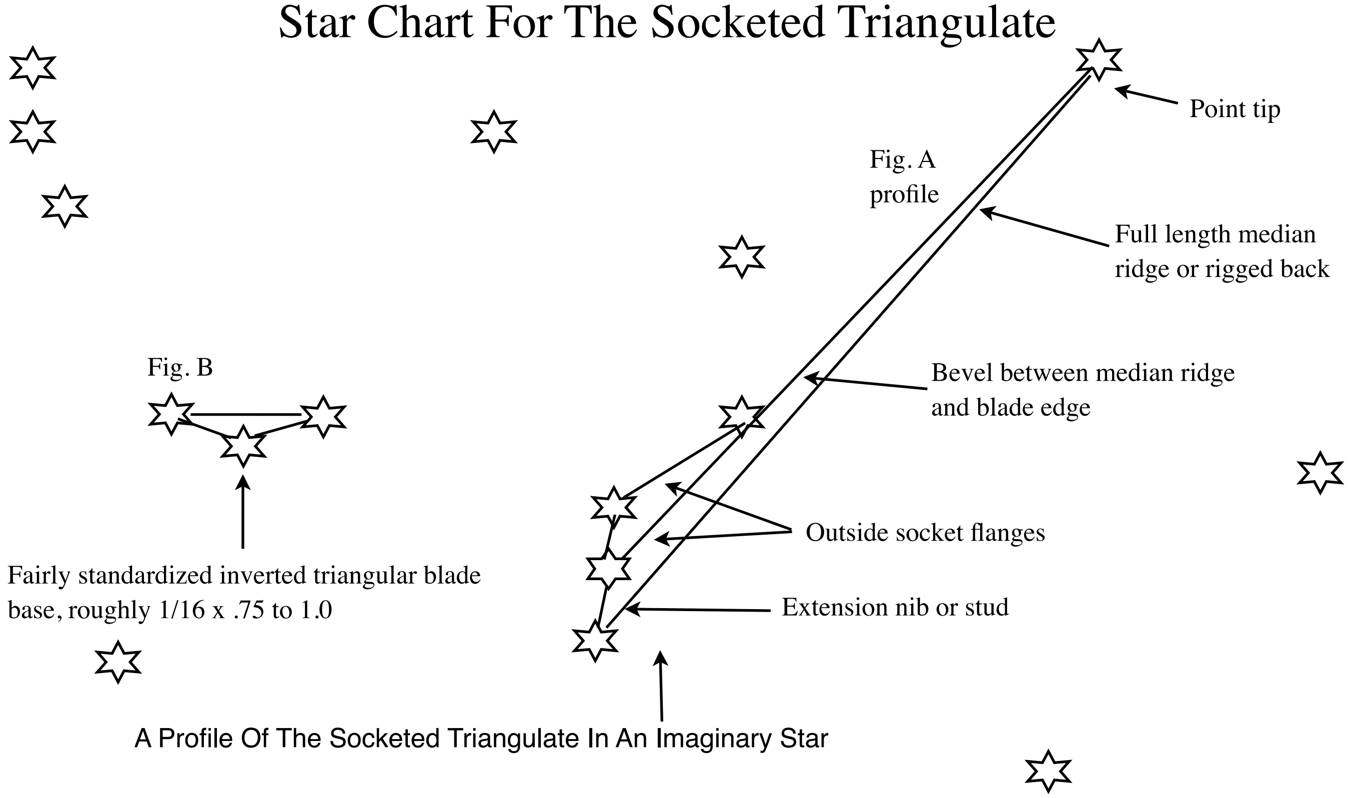
First, it is our observation that the Socketed Triangulate is; a well a designed tool of war and implement of the hunt. Ancient man probably found it efficient and functional. Indications of its functionality are (1) its proliferation in Wisconsin and nearby areas, (2) it popularity over time. (3) the sophistication of its design (4 outer sides and 3 inner sides on its socket, for example) and (4) the skill, energy and time required for its production in comparison to simpler copper projectile points.

Still, as efficient and utilitarian as the Socketed Triangulate may have served its owners, the unnecessary intricateness of its form, the planners' obsession with triangles, and the craftsman's fixation on the triangular thickness of the blade base, all suggest more than utility. Future students of copper, especially those with advanced statistical skills, may find the whole point type is designed around that single triangle, roughly 3/16 of an inch high with a 3/4 to 1 inch base. This little triangle appears to be the seat, the heart, or perhaps the the womb in which all other Socketed Triangulates traits were built upon or conceived in.

Speculations

This base angle, made of 3 three dots or points, may have received its inspiration from 3 stars in the heaven. Many sets of stars are perceived as triangles, and perhaps one such set suggested this triangle, and copied by early copper smiths. Or, perhaps a set of stars suggested the overall design for

Star Chart For The Socketed Triangulate



A Profile Of The Socketed Triangulate In An Imaginary Star the Socketed Triangulate. Ancient craftsmen may have seen a profile of the Socketed Triangulate in a set of five stars. Another 3 stars may have suggested its blade base triangle.

We know that many old cultures studied the the heavens and perceived images among the stars. While it is true that any imagined image can be formed by connecting lines between selected stars, it is also true that many civilizations agreed upon perceived formations of star pictures for hundreds, perhaps thousands of years. If early man saw his universe divided between physical objects that he could see, feel, and touch, and spiritually symbolic images not clearly visualized, our earth must have represent the first, while the heavens were the primary abode for the gods.

Solutions to problems found in dreams or received from the heavens might be seen as gifts from the gods. In myths and legends, man usually attributed major advances (fire, pottery, tobacco, etc.) in adaptation to his harsh and cruel environment, as gifts from the gods, or sometimes treasures stolen from the gods. Finding a blue print for a valuable utility from among the stars might well be viewed as a gift from the gods. In reality, early man found images in the heavens simply by connecting the dots, by drawing straight lines between selected or neighboring stars. Is there any evidence that a blue print for Socketed Triangulate might have originated in the stars?

Steve Livernash from Wisconsin Rapids, Wisconsin, <u>may</u> have found a <u>possible</u> archive of ancient blue prints perhaps used by old copper smiths to craft Socketed Triangulates and other valuable Old Copper Complex utilities. And these possible blue prints consist of dots and lines which sometimes adorn copper knives, socketed projectile points, and other implements. Steve does not claim that the dots in these <u>possible</u> blue prints represent stars, but we must consider that possibility. We will await more research from Livernash and others.

Fig. 17

5.6”
Michigan

Socketed
Triangulate
Projectile
Points

Fig. 17 Is a Round Shouldered Variety.

Fig. 18 Has An Oxidized Socket.

Fig. 19 Had A Much Longer Original Blade.

Fig. 18

7.5
WI

Fig. 19

5.7
MI

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The History, Typology And Nomenclature For The Socketed Ovate

Fig. 1
Sauk Co. WI
5 1/2” long

Fig. 2
Fond du Loc Co. WI
4” long

Fig. 3
WI Farm Find
5 7/8” long

The Socketed Ovate was first and best described by West in 1904. He called it the Rolled Socketed Point and described it as (1) not as common as the Ridged Back (Socketed Triangulate, (2) unlike the Ridged Back (Triangulate), it exhibited a blade and stem (tang) on separate planes, (3) it possessed no central (median) ridge, and (4) many specimens possessed a rivet home in the base of its socket.

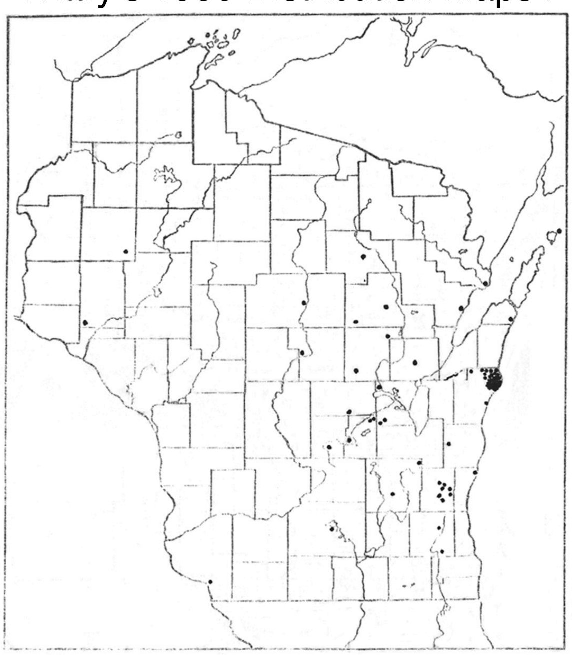
Brown (1904: 76-77) identified two varieties of the Rolled Socket (Socketed Ovate). He described the traits of the first variety as (1) having a short, broad oval blade, (2) with a socket widest at its base and protracting toward its blade, (3) averaging 4” with one reaching 7,” and (4) sockets often equaled the blades in length. He described the second variety as (1) having a longer, narrower lanceolate shaped blade, (2) a blade twice as long as its stem (socket), and (3) a socket with a more or less equal, overall width rather than tapering toward the blade base.

West (1928: 73-75) was next to recognize the Socketed Ovate, but he diid so in a very general way, as a Socketed Tang Point. He did not discriminate it from other socketed tangs, except in a general description of several separate types, including the Socketed Ovate, the Socketed Triangulate and half a dozen other types of socketed projectile points. He also pictured one illustration of each type, including the socked Ovate. He also mentions it leaf (oval) shaped blade and a pin hole in its socket.

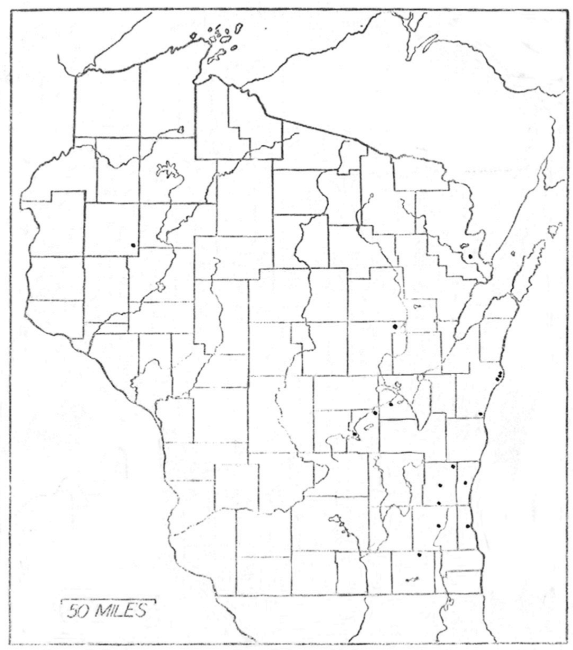
Flaskerd (1940: 37-38) noted the Socketed Ovate, which he called Socketed Tang and pictured two illustrations of the Socketed Ovate. He noted pin holes in their sockets, and their gently rounded (convex) faces (blade surfaces). Ten years later Wittry (1950: recognized the Socketed Ovate, calling it the B1 Socketed, Rolled Socket. It has since answered to the name, B1.

Wittry describes the B1 Socketed, Rolled Socket as leaf shaped, with gently rounded faces, some with rivet holes, and some decorated with punched lines and dots. He recognized three varieties, B1, with a pin hole, B2, the same as B1, but without a pinhole, and B3 Harpoon, the same as B1, but with a chiseled barb on the edge of the blade. His distribution map for the Socketed Ovate is nearly identical to his distribution map for the Socketed Triangulate, except they are only half as numerous. Still, they are more numerous than any other projectile point in Wisconsin at the time, except for the Socketed Triangulate. His sample for B3 harpoon is only 1.

Wittry's 1950 Distribution Maps For The Socketed Ovate In Wisconsin



Map 23. Distribution of Type II-A1 in Wisconsin.



Map 24. Distribution of Type II-A2 in Wisconsin.

General Description

The Socketed Ovate point may be the sister or companion to the Socketed Triangulate (see examples in photos). These two socketed implements look very much alike, but their distinctive differences are as follows. While the Triangulate has hard sharp angles, straight lines and flat surfaces, the Ovate has soft rounded curves, smooth lines and ovate contours. The Ovate also lacks the Triangulate's median ridge and the nib or stud at the end of Triangulate's triangular socket base. But, the Ovate very often exhibits a pinhole near the base of their oval sockets.

A cross section of the Ovate's blade is oval, as is a cross sectional view of its socketed tang, See figs. 1-18. The blade, itself, is also oval in outline (See examples 1-3, 5 & 6, 12-15 & 17). The tang socket is oval, rather than faceted like the Socketed Triangulate and it is easier to tighten the socket about its shaft, which does not have to be so perfectly shaped to fit the socket. The Ovate's bond to its shaft is not so secure, however, as is the Triangulate's. To make it secure a rivet is often inserted through the socketed tang butt, securing it to the wooden shaft (See figs 1, 2, & 3).

The blade tip point on the Ovate is rounded, not so pointed as the Triangulate, but it is symmetrical, right and left, obverse and reverse, whereas the Triangulate is symmetrical right and left, but not obverse and reverse. And the Ovate's blade is wider in proportion to its over all length than is the Triangulate's, and lacking a median ridge (om most specimens) the blade is rounded, obverse and reverse. (see figs. 1-3). These traits subtract from its power of penetration, but add to its usefulness in skinning and de-boning. For these reasons some look upon the Socketed Ovate as a domestic knife.

It is obvious that Socketed Ovate would have made a great utility knife for still more reasons. Lacking a long narrow point it would have made a poor dagger, but unlike the Socketed Triangulate, it will cut or skin in either direction from both the obverse and reverse sides. The point is blunted and sharp all the way around, right and left, obverse and reverse. The narrow, tapered tips found on most spear points would tend to hang up on bones while skinning and deboning, but the rounded point found on the Ovate would have slipped around bones with ease. The short wide blade with its rounded tip provides strength in performing domestic tasks which might bend or brake longer Triangulates and most other elongated point tips associated with projectile points.

The flat to rounded surfaces found on both the obverse and reverse areas of the Ovate's blade are associated with knives, whereas median ridges are associated with spear points and daggers. The rounder blade point on the Ovate would have required far more force to penetrate its target, than would the narrow pointed tips associated with projectile points like the Triangulate. For all of these reasons the Socketed Ovate is an excellent candidate for domestic knife work.

While the Triangulate's hard angles, flat surfaces and long sharp points, and stud appendix, all suggest war and hunting, these characteristics may have also symbolized maleness. The shorter Ovate with its pinholes, soft rounded curves, smooth lines, ovate contours, and blunted point suggests not only domestic tasks, but also feminine characteristics.

Thus, theses two implements, the Triangulate and Ovate points may be companion blades, one with tasks best fitted for war and hunting and the other more suited for familiar domestic chores. Both may symbolize more than divisions of labor. Phallic and fertility symbolism exerted powerful influences our early ancestors and may have played significant roles in the preservation and continuance of life. The Ovate point may, therefore, have been a woman's knife. Is it possible that these domestic knives, like many other domestic tools, were made by the women who used them?

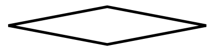
There is no sure reason, to believe either the Ovate or Triangulate precedes the other. It is not clear, either, that one type was used exclusive in certain locations. Based on the numbers available for our observation, the Triangulate appears to be more numerous and some may be older.

There are at least eight varieties of the Socketed Ovate: (1) Classic A has a pinhole, a stepped socket, (2) Classic B has a stepped socket, but no pin hole, (3) Classic C has neither a stepped socket nor a pin hole, (4) Classic D has a short, wide blade, with combinations of stepped sockets and pin holes, (5) Beveled Blade Edges, some with angled shoulders like the Northern variety, (6) Median Ridge on one or both blade surfaces, otherwise very similar to Classic varieties, A-D, and (7) A Northern Variety with a bifacial median ridge and angled shoulders, and (8) one with a gash chiseled into the side of the blade, forcing out a spar or barb, converting it into a harpoon head.

Socketed
Ovate Type
Northern
Variety

Michigan
5 9/16"
Long

Fig. 4



Socketed
Ovate Type
Northern
Variety

Minnesota
5 5/8"
Long

Fig 7

Socketed Ovate Type
Northern Variety

The Northern variety of the Socketed Ovate is found primarily in Canada, but they are sometimes recovered further south. At least a few of the Northern variety were found in Minnesota and Michigan, and perhaps in Wisconsin and other areas. Upon further study, we may find that the traits of the Northern variety are sufficiently different from the Socketed Ovate that we will classify them as a separate type. Brown, Flaskerd, and Wittery do not mention the Northern, but West Pictures one.

The primary traits of the Northern variety are: an ovate socket, a long, narrow and triangular blade with sharp, extended point tips. The blade edges are fairly straight as opposed to the Ovates' curved or convex blade edges and the Northern variety displays a median ridge on both sides of the blade. Like the Triangulate and unlike the Ovate, it has a straight rigged back and angled shoulders. Unlike the Triangulate, some Northern specimens exhibit pinholes in their sockets, see fig. 7 above.

A majority of the Socketed Ovates, examined in this research, were found many years ago in plowed fields, and many were cleaned by their finders. Most of the uncleaned blade exhibited an old tight residuum patination. Cleaning seldom destroys all traces of the patina, or the erosion scars, and these scars most often exhibited on the Ovate are the worm track erosion pattern.

Of course, motives other than those suggested here may have inspired the creation of two types so similar in appearance, yet so different in actual style and probable use. Such inducement may have included various physical needs, cultural differences, new technology or influences we cannot guess. We do not even know that the two types, Socketed Triangulate and Socketed Ovate were used side by side in the same cultural at the same time. Both points, like all points identified as spear points, are symmetrical. The Socketed Ovate is not as common as the Socketed Triangulate. The distribution of the two is about the same and both types have their varieties.

Skinning Survey And Speculation

In 1996, while studying the Socketed Ovate, I made the rounds to several butcher shops in West Michigan. At the time, butchers were decreasing in numbers. Whereas, a few years earlier, one found authentic stockyards and butcher shops in nearly every community, technology was changing. Butchering became more centralized, and the skinning technology moved from knives to air guns. I placed a Socketed ovate in my pocket and visited older butchers with year of experience in slaughtering, skinning, and butchering.

I asked each butcher if he would answer a few questions for a survey on desirable traits for skinning knives. I asked each about their year of experience, and the kind of a knife they used. Next I asked each to think about a perfect skinning knife and what it would look like. And then I asked each, if they were asked to design a perfect skinning knife, imagine what the blade would look like. As they described their ideal skinning blade, I recorded the traits they described. I gave this test to 12 butchers, all with ten years or more of experience in slaughtering, skinning and butchering. The blade they described were limited to one they would prefer to use in gutting-out and skinning cows, pigs, sheep, deer and small game. After recording their answers, I also interviewed the Deer Slayer.

The Deer Slayer was born in the 1922. He had five older and one younger brother, but he was the family hunter, and at an early age he often provided meet for the table. Later, in the 1940's, he married and grew a large family. From the 1930 until today, he hunted deer with rifle, shotgun and bow and arrow. For the last 70 years or so, he has averaged several deer a year, but in his prime, he shot, skinned out, and cut up to a dozen or so a year. In July, during the 1950s, I visited the Deer Slayer's home and he offered me a piece of fresh venison mince meat pie. I found his remarks in my survey particularly useful. For obvious reasons we have not used his real name.

After each interview I pulled a Socketed Ovate from my pocket and asked, "What do you think of this?" After talking about knives and knife blade traits, the butchers inevitably ask, upon seeing the ancient Socketed Ovate, "What's that?" "It is the perfect knife, you have been describing," I responded to each. The old patina and erosion patterns threw them off. They didn't understand all the dirt and crud. When I explained that it was probably more than a couple thousand years old, that Indians probably used it to skin and cut up game, and they examined it in detail; they all agreed, it would work well if it was cleaned up and sharpened.

Many of the butchers used terms like, "it can't be too big, it must be kind of small, a little on the short side, the size of my jackknife," all in comparison to big 6 to 10 inch butcher knife blades and 6 inch hunting knife blades. I recorder such statements in Table 1, as "Fairly small, under 6 inches".

Two Socketed Ovate

Wisconsin
5 1/2"
Long

Fig. 5

Wisconsin
5 1/16"
Long
Beveled
Variety

Fig 6

Fig. 5 is a classic Socketed Ovate without a step or a pinhole, while fig. 6 is a Beveled variety of the Socket Ovate with a pine hole. Both specimens have oval sockets, but this beveled example (fig. 4) has angled shoulders. Not all Beveled varieties of the Socketed Ovate have angled shoulders and/or pinholes.

The sockets on fig. 5 and fig. 6 are very different. Fig. 5 has no step and the socket is shorter than its tang. Fig. 6 exhibits a classic step and the socket uses more of its tang length than does fig. 4. Fig. 6 is a solid well designed and well crafted piece, while fig. 5 exhibits lap lines on both sides of it blade and the back side of its tang. All lap lines, however, have remained tight.

Both specimens exhibit a worm track erosion pattern, but the worm tracks found on fig. 5 are very faint and immature, while the worm tracks on fig. 6 are far more pronounced. (Continued on Page 34).

Two Socketed Ovates
Step Variety

Fig. 9

Fig. 10

Figures 9 and 10 are Beveled verities with steps, no pinholes, angles shoulders, triangular blades and sharp tip points. Both of these specimens appear to be related to the Northern variety. Fig. 10 probably once exhibited a pinhole which has mostly oxidized away.

Two Socketed Ovates

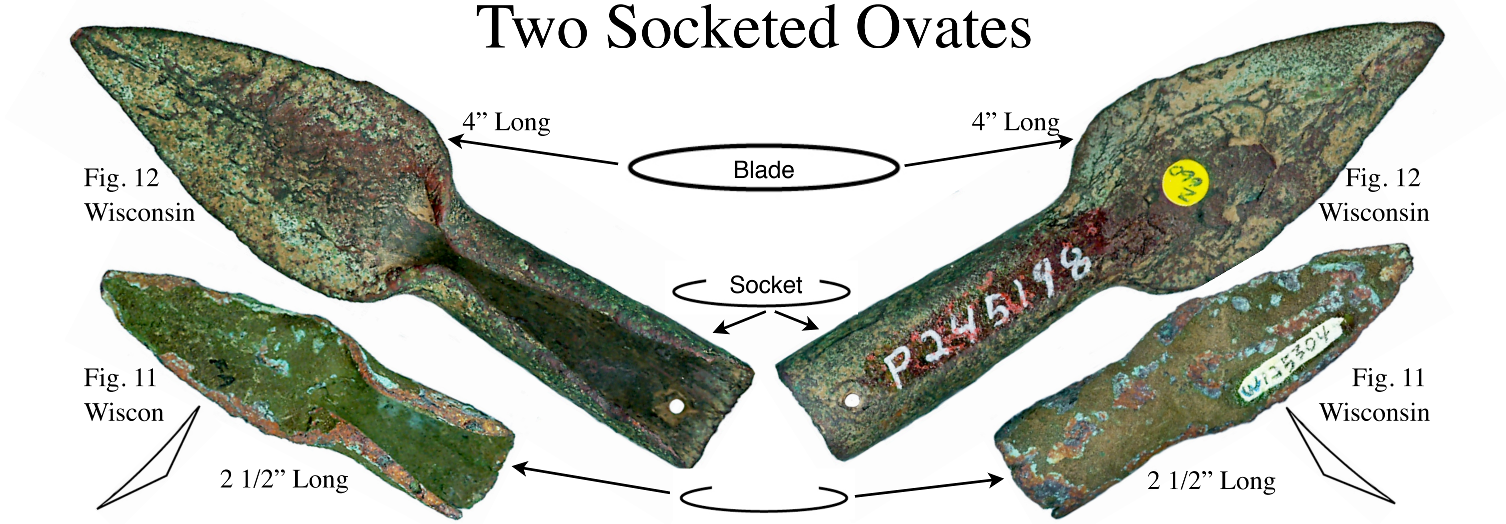


Table 1 Butchers Survey On Ideal Gutting and Skinning

No.	Small, Under 6"	Blunt Tip	Sharp on Both Sides	Thin	Work in Either Direction	Soft metal Easily Sharpened	Years of Experience
1	x	x		x	x	x	10
3	x		x	x		x	17
4	x	x	x	x	x	x	12
5		x	x	x			15
6	x		x	x		x	12
7	x	x	x			x	37
8			x	x		x	29
9	x	x			x	x	14
10			x	x	x		18
11	x	x		x	x	x	21
12	x	x		x	x	x	33
13	x	x	x	x	x	x	50
Total	9	8	8	10	7	10	158-12.15

N = 13, Total Years experience = 158, Average years experience = 12.15

For the most part butchers wanted a fairly small, thin blade, not too pointed, and crafted from metal soft enough to be easily sharpened. They also wanted it sharp on two sides, so they could cut in either direction. It was mentioned that points too sharp might accidently puncture hides, and catch on bones, whereas a somewhat rounded point, sharp on both sides, could easily move in any direction without having to turn the knife over. It would also slid around bones well, and wouldn't puncture hides.

Some butchers may have felt that "sharp on both edges," "work in either direction," and the ability to work with the blade obverse and reverse, were all the same trait. It is obvious that the Socketed ovate meets the requirements for modern skinners, even if they didn't recognize the ancient implement upon first seeing it.

Most of the traits described by the butchers are found in most of the Socketed Ovate varieties, see Tables 2 and 3 below. The total number of samples is 16.

Three Socketed Ovates

Fig 17 is a Beveled Variety. Fig 13 is Median Ridge variety. Fig 14 is a Classic Stepped variety

Fig. 17

Michigan
9 1/4”
Long

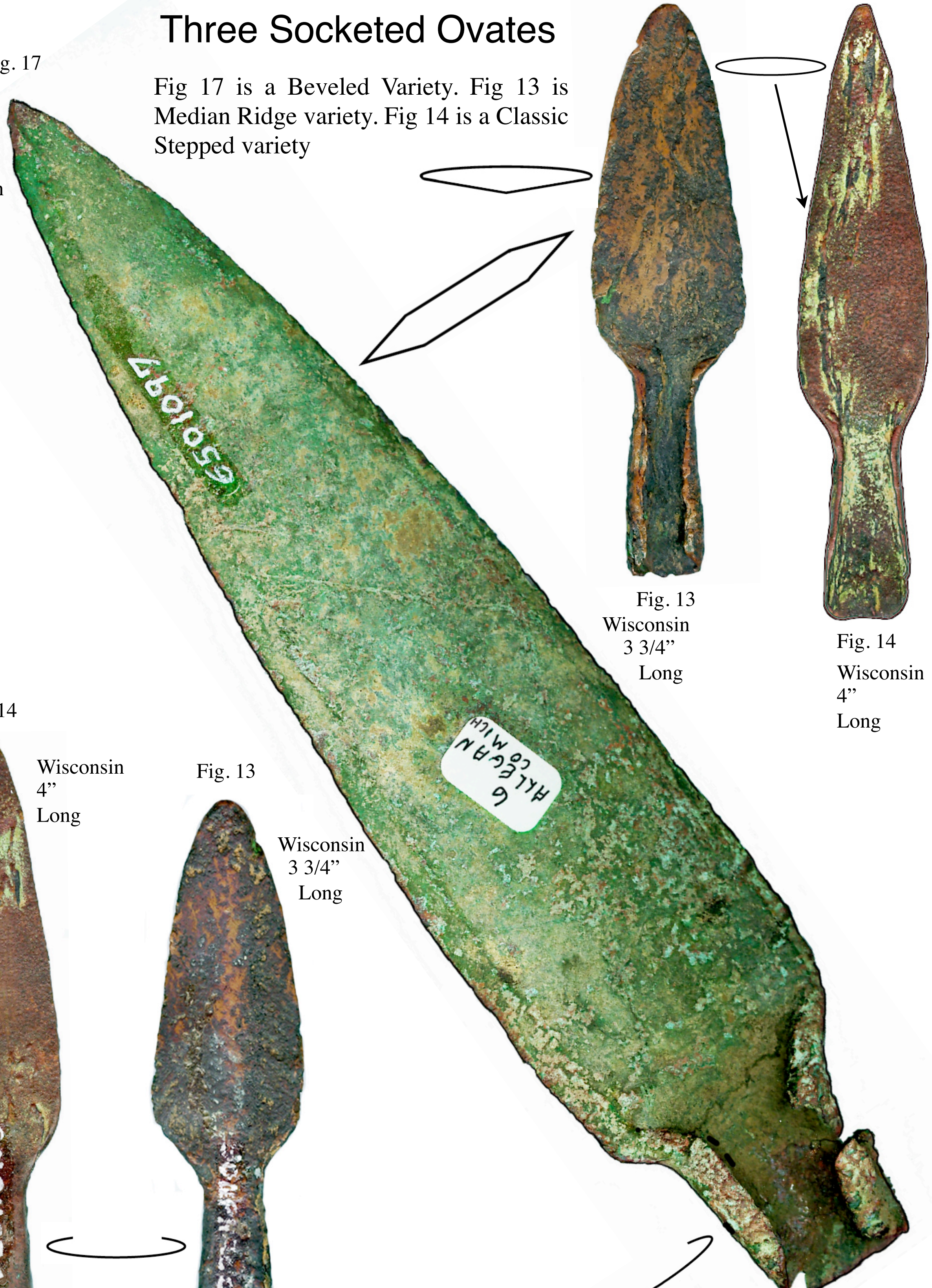


Fig. 13
Wisconsin
3 3/4”
Long

Fig. 14
Wisconsin
4”
Long

Fig. 14

Wisconsin
4”
Long

Fig. 13

Wisconsin
3 3/4”
Long

Four Socketed Ovates

Fig 17

Michigan
9 1/4"
Long

Fig 18
Wisconsin
7 1/8"
Long

Fig. 15
Wisconsin
4 3/4"
Long

Fig. 16
Michigan
2 3/4"
Long

Fig. 18

Fig 15

Fig 16

Table 2, Major Attributes Of The Socketed

No.	Inventory No.	Classic	No Pinhole	No Step	Bevels	Median Ridge	Short & Wide	Harpoo n
1	30027997	x						
2	9012					x		
3	P3001298	x						
4	P225999		x					
5	817158			x				
6	9013				x			
7	MN3001203					x		
8	P255198						x	
9	P2501298	x						
10	50PH200397	x						
11	W125304					x		
12	P245198				x			
13	50UPN200397			x				
14	SNPH275397		x					
15	C175698	x						
16	X50997					x		
17	6501097				x			
18	207			x				
18	Totals	5	2	3	3	4	1	0

The groupings and totals above are somewhat deceiving as the traits used to define the varieties of the Socketed Ovate are not exclusive, see Table 3. The two specimens categorized as "No Pinhole," are also "Classics. All "Short and & Wide" specimens exhibit short blades, but not all of these short blades are wide. Some specimens with bevels or median ridges also have pin holes. other traits overlap, occurring on more than one variety of the Socketed Ovate. See Table 7.

Figures 4, 7, 16, 17 & 18 may be a separate types rather than a variety of the Socketed Ovate. If this is true, they are probably a later type, younger in age, but clearly resemble the Socketed Ovate. Several influences may have changed varieties or types over time. Sometimes the changes are so minor, the presence or absence of a pinhole or step, for example, that we consider the changed point a variety of the type. At other times, the traits are so different that, the specimen may be seen as a different type. See Figs. 4 & 7 for more details. Also see figs. 30-33 for step formation variety.

Table 3, Traits Found In The Socketed Ovate Type And Its Varieties

No.	Inv. No.	Pinhole	No Pinhole	Step	No Step	Bevel	Median Ridge	Short & or Wide	
1	30027997	x		x					WI
2	9012	x		x		x			WI
3	P3001298	x		x					WI
4	P225999		x				x		MI
5	817158		x		x				MI
6	O9013	x		x		x			WI
7	MN3001203		x	x			x		MN
8	P255198		x	x		x		x	WI
9	P2501298	x		x					WI
10	50PH200397	x		x					WI
11	W125304		x			x	x	x	WI
12	P245198		x	x				x	WI
13	50UPN200397		x				x		WI
14	SNPH275397		x	x					WI
15	C175698	x		x					WI
16	X50997		x					x	WI
17	6501097		x			x			MI
18	207		x						WI

Types are based on cultures, the cultures that created the type. If a specimen is found in an area distant from the type's cultural base, and more importantly, if the specimen is found in a separate temporal zone, these facts are important in classifying the specimen as a variety of a type or a new type.

Table 4 Socketed Ovate Measurements

No.	Inv. No.	Wt. Oz.	Over all Length	Width	Blade L	Blade W	Blade TK	Socket L	Socket W	Socket Tk	PR
1	30027997	1.9	5 12/16	1 2/16	3 12/16	1 12/16	2/16	1 6/16	1 11/16	1 6/16	WI
2	9012	1.70	4	1 4/16	2 10/16	1 4/16	3/16	1 3/16	12/16	4/16	WI
3	P3001298	2.6	6	1 2/16	4 10/16	1 2/16	1/16	1 4/16	10/16	6/16	WI
4	P225999	2.10	5 9/16	1 1/16	4	1 1/16	3/16	1 8/16	12/16	4/16	MI
5	817158	1.7	4 8/16	1 3/16	3 9/16	1 3/16	3/16	14/16	14/16	4/16	MI
6	O9013	2.3	5	1 3/16	3 14/16	1 3/16	3/16	14/16	12/16	6/16	WI
7	MN3001203	2.8	5 9/16	1 4/16	3/16	1 4/16	3/16	1	10/16	5/16	MN
8	P255198	1.3	3 12/16	1	2 2/16	1	3/16	1 8/16	12/16	6/16	WI
9	P2501298	2.4	5 2/16	1 2/16	3 12/16	1 2/16	3/16	1 4/16	14/16	6/16	WI
10	50PH200397	0.9	3 12/16	1	2 8/16	1	2/16	1 8/16	6/16	6/16	WI
11	W125304	0.6	2 9/16	12/16	1 6/16	12/16	3/16	1	5/16	6/16	WI
12	P245198	1.9	4	1 2/16	2 4/16	1 2/16	3/16	1 14/16	12/16	7/16	WI
13	50UPN200397	1.1	3 11/16	1	2 7/16	1	2/16	1 6/16	8/16	3/16	WI
14	SNPH275397	0.9	4	14/16	2 12/16	14/16	2/16	1 10/16	5/16	2/16	WI
15	C175698	1.6	4 12/16	1	3 8/16	1	2/16	1 2/16	10/16	3/16	WI
16	X50997	0.3	1 12/16	11/16	1 12/16	11/16	2/16	1	7/16	1 4/16	MI
17	6501097	8.6	9 4/16	2 2/16	8	2 4/16	3/16	1 12/16	1 4/16	3/16	MI
18	207	2.8	7 2/16	1 2/16	5 12/16	1 2/16	2/16	7 13/16	13/16	8/16	WI
N	Averages	2.05	4 6/8	1 1/8	3 2/8	1 1/8	1/8	1 11/16	6/8	7/16	PR

Blade length plus socket length are often often less and occasionally more than the overall specimen length.
PR = Provenance. N = Number of Samples

Simple variations like pinholes and socket steps often indicate simple technological improvements or change in use. Pinholes receive rivets to secure staffs or handles. Steps between blade bases and socket tops prevent the staff or handle from slipping forward upon impact and these two traits are found on several other types, as are many traits. It is the distinct combinations of traits that define types.

Socketed Ovate Table 5
Erosion Patterns and Patina Categories

No.	Inv. No.	Erosion Pattern	Patina Category	PR
1	30027997	WT	N	WI
2	9012	WT	E	WI
3	P3001298	WT	N	WI
4	P225999	WT	N	MI
5	817158	I WT	E	MI
6	9013	WT	N	WI
7	MN3001203	Pitted	Cleaned	MN
8	P255198	WT	E	WI
9	P2501298	WT	N	WI
10	50PH200397	WT	Cleaned	WI
11	W125304	WT	N	WI
12	P245198	WT	N	WI
13	50UPN200397	WT	N	WI
14	SNPH275397	WT	N	WI
15	C175698	WT	N	WI
16	X50997	WT	N	MI
17	6501097	WT	N	MI
18	207	Pitted	N	WI

Most copper specimens show two or more erosion patterns and two or more patina categories. In this research the erosion pattern and patina category thought to be associated with greatest age are the ones recored on each specimen. This identification procedure is followed even if the oldest erosion pattern or patina category is not the most common found on a given specimen.

The purpose of this procedure is to identify each specimen with the erosion pattern or patina category which requires the longest period of time to develop. Although any given patina category or erosion pattern may require varied amounts of time to develop, in general, it is thought both are a predictors of age.

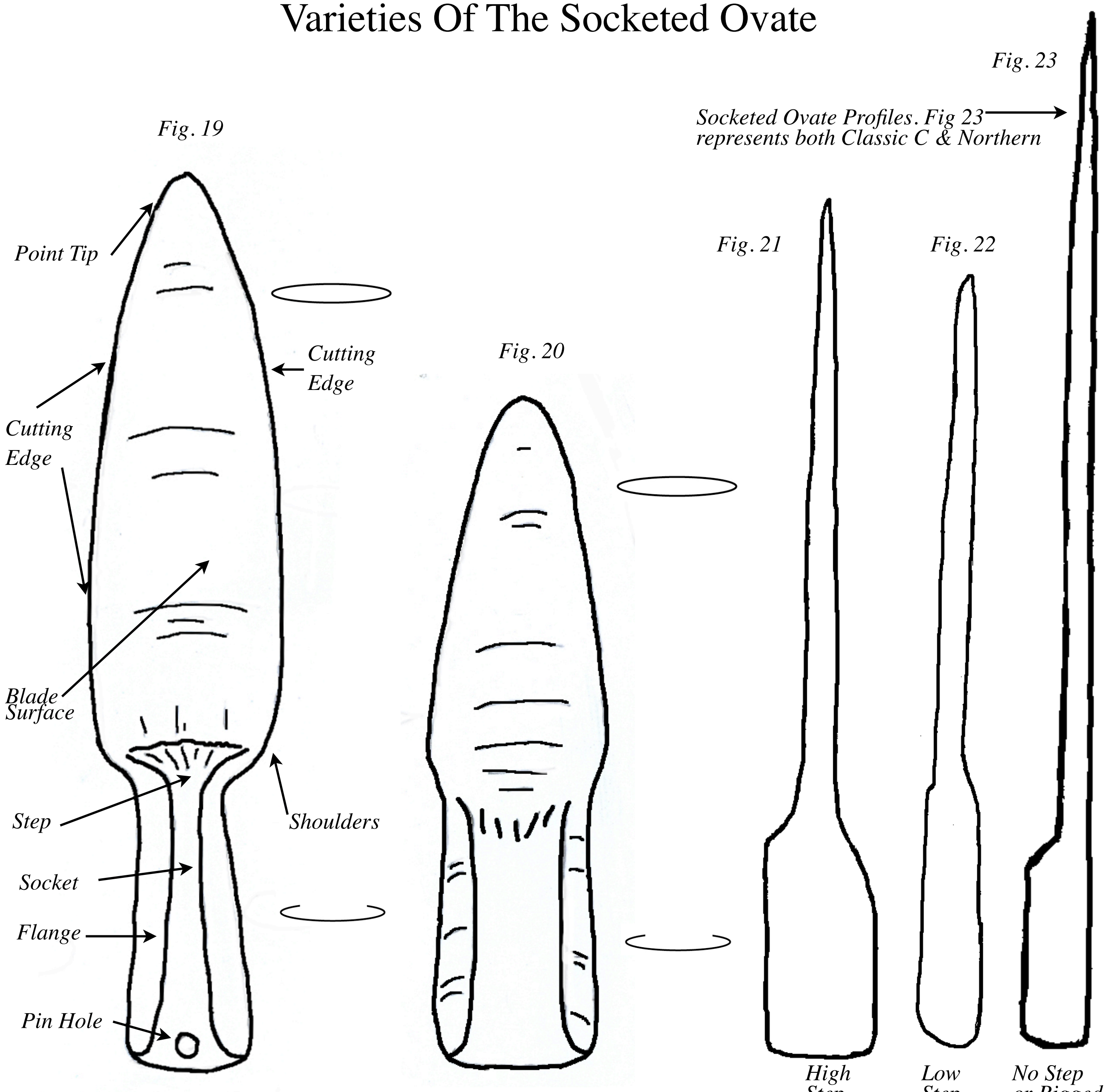
In examining these 18 samples, we find that the Socketed Ovate most closely associated with the erosion patterns and patina categories which require the most time to develop.

18 Socketed Ovate By State Of Origin Table 6

Number	Provenance
13	Wisconsin
4	Michigan
1	Minnesota
Total Or Sample =	18

Figures 4, 7, 16, 17 & 18 may be Socketed Ovarte, or they may separate types with similar traits crafted by different cultures.

Socketed Ovate Typology
Varieties Of The Socketed Ovate

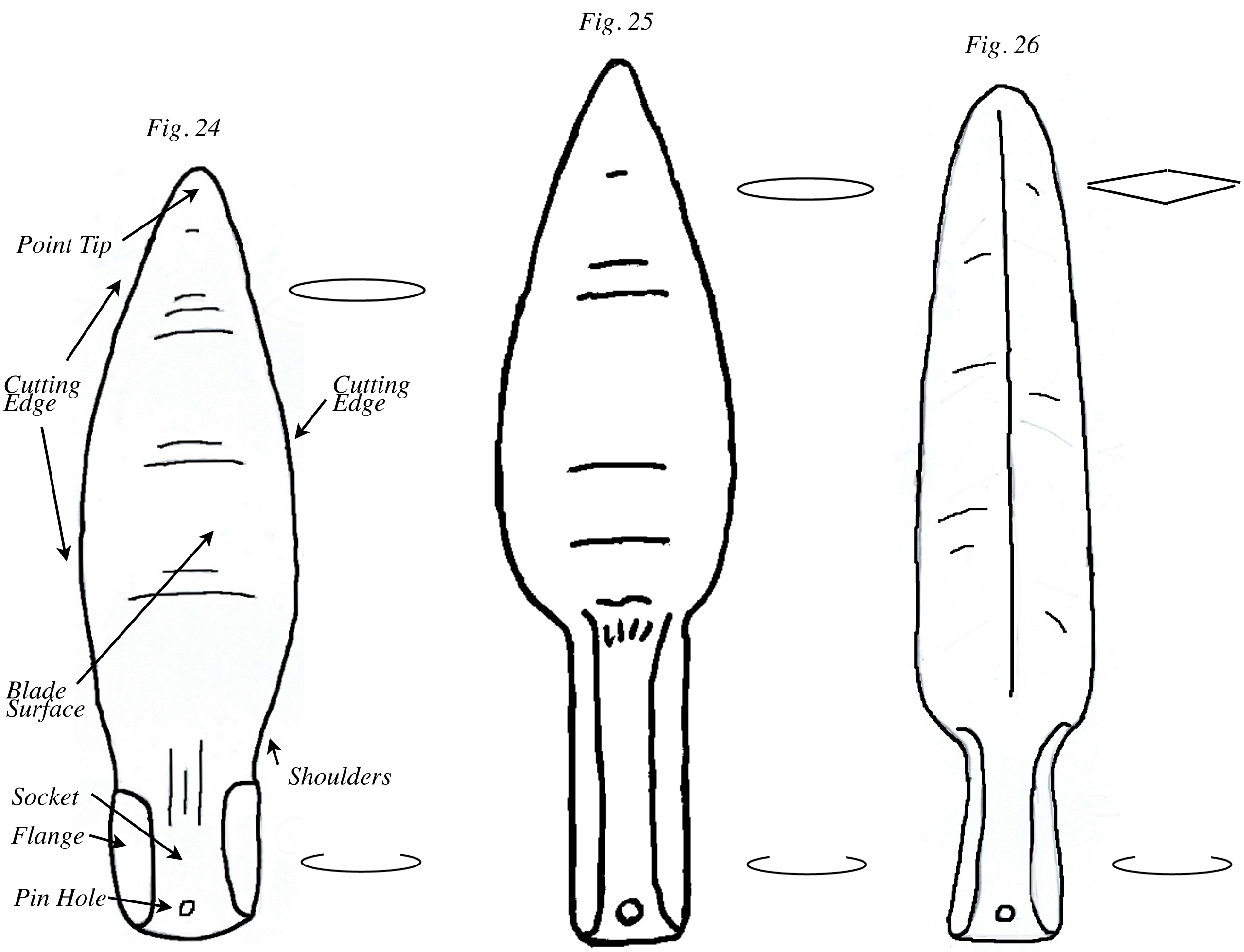


Classic A Variety *Classic B Variety*

Classic A: Figure 19 (above) has the classic oval blade, round shoulders, blunt point, convex to plano-like blade surface, and oval cross sectional blade view, as well as a sharp blade all the way around its blade edge. Classic A has an oval stepped socket with a pinhole for a copper rivet and its oval in a cross sectional view.

Classic B: The classic B variety has the Classic A attributes and characteristics, but it does not exhibit a pin hole for a copper rivet.

Socketed Ovate Typology – Varieties



Classic C Variety *Classic D Variety* *Median Ridge Variety*

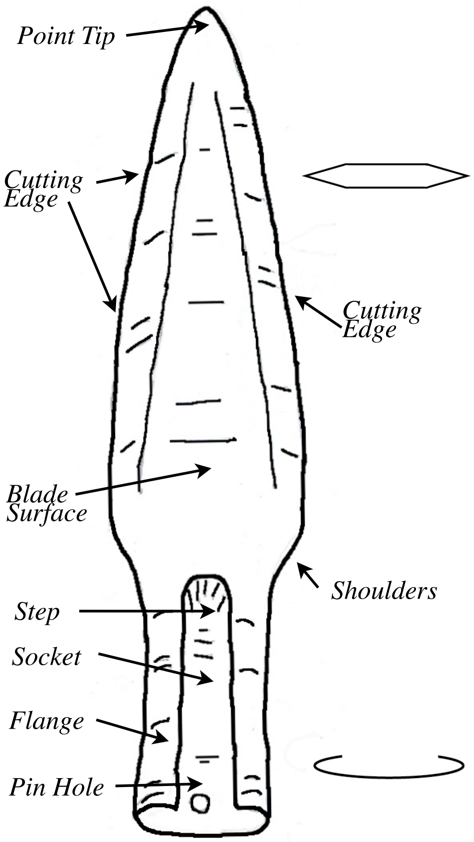
Classic C: The classic C variety has the Classic A & B attributes and characteristics, but it does not exhibit a step in its oval socket.

Classic D: The classic D variety has the Classic A, B & C attributes and characteristics, but it has a Short And Wide Blade.

Median Ridge Variety: The Median Ridge variety has a distinct variation; it sports a median ridge where the Classic varieties show a convex to plano-like blade surface. In addition some Median Ridge varieties have angled shoulders. The Median Ridge variety is, therefore, the first step in a move away from the classic Socketed Ovate taxonomic class. The Next variety, the Beveled Variety movers even further from the norm.

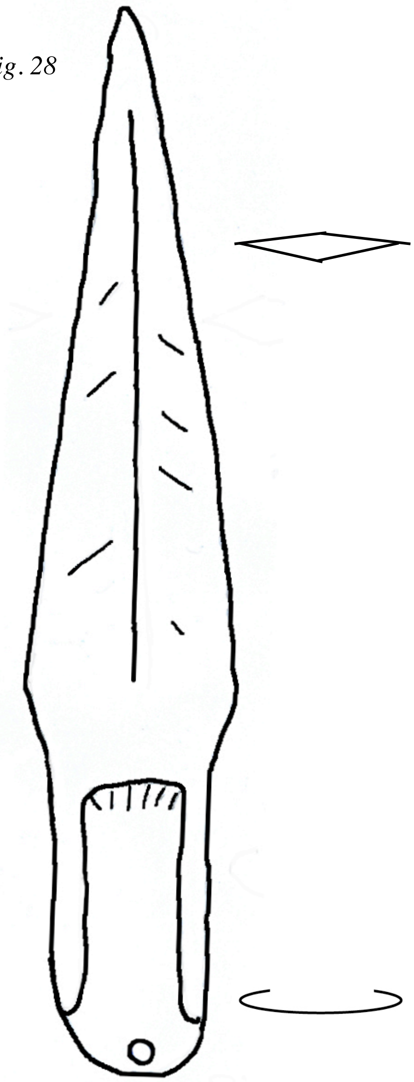
Socketed Ovate Typology – Varieties

Fig. 27



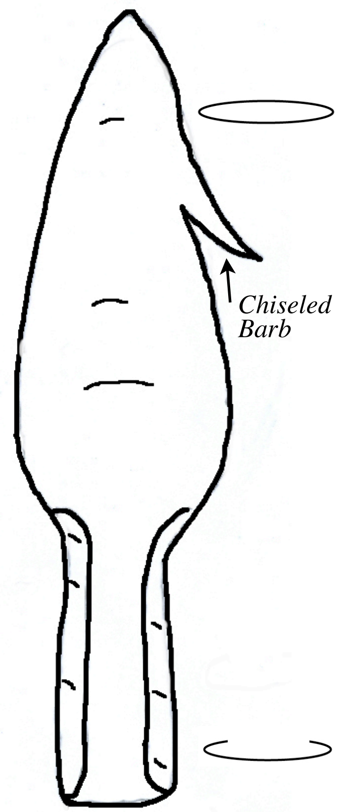
Beveled Variety

Fig. 28



Northern Variety

Fig. 29



Northern Variety

Beveled Variety: Figure 27 (above) has the classic oval socket and it may have a pin hole. Classic A shoulders may be more angles and the point may be a little more pointed, more importantly i t will exhibit a bifacial bevels along each cutting edge.

Northern Variety: The Northern variety exhibits a median ridge, usually on both sides. Some have rivet holes and most have stepped oval sockets. Unlike other Ovates, the Northern has a rigged back from point tip to socket base, with no bulge for the socket See Fig. 23. The Northern is more closely related to the Socketed Triangulate and may be a separate type.

Harpoon Variety: The harpoon variety is rare**.** It is a simple modification to any Socketed Ovate. A spur is chiseled from the top blade edge to create a harpoon. Some Ovates and possibly other blades were modified by drilling a pin hole into the blade tip and inserting a vertical harpoon barb.

Varieties Of The Socketed Ovate Type
Table 7

ID No	Classic A	Classic B	Classic C	Classic D	Median Ridge	Bevel	North.	Harpoon
P2501298	x							
R7501278	x							
C175698	x							
138		x st.						
SNPH275397		x st.						
3127			x np					
-0-			X np					
207			x np					
9012				x st				
SNPH275397				x st ph				
W125304					x st			
P3001298					x st ph			
SNPH275397					x			
P245198						x st swb		
6501097						X st		
9013						x st		
MN3001203							x st ph	
P225997							x st	
Totals	3	2	3	2	3	3	2	0

N=18

N = number st = Stepped Socket np = No Pin Hole ph _ Pin Hole

In Table 7 our sample, 18 of the Socketed Ovate type, are divided into 8 possible taxonomic classification, each called a variation of a type, in this case, the Socketed Ovate type.

Socketed Ovate Varieties
Summary

The Socketed Ovate has an oval symmetrically shaped blade with a rounded tip. The blade is usually sharp, all the way around, from point tip to socket, on both sides. Most have convex to plano-like blade surfaces and the blades are, therefore oval in cross sectional view.

Some few blades exhibit a median ridge on one or both sides of their blade length. Another small group have bilateral beveled blade edges. The vast majority has rounded shoulders, while a few exhibit angled blade shoulders.

Socketed Ovates also have oval shaped sockets. Some exhibit a stepped socket while others do not. A majority of the Ovates exhibits pin holes for rivets near the base of their socket. Some specimens show both stepped sockets and pin holes while others exhibit neither. Sockets are always oval in cross section.

One variety (Classic C) has no step and no Pinholes. A few other varieties include occasional specimens with no sockets. With the exception of the Northern, all sockets are accommodated with bulges on both the front and back. The Northern accommodates the whole socket on the front and exhibits a rigged back.

Socketed Ovate specimens are for the most part composed of oval shapes, rounded surfaces, and curved lines. The Socketed Ovate appears to be related to the Socketed Triangulate

There are at least eight varieties of the Socketed Ovate:
(1) Classic A has a pinhole, a stepped socket, and a blade longer than its socket,
(2) Classic B has a stepped socket, but no pin hole.
(3) Classic C has neither a stepped socket nor a pin hole.
(4) Classic D has a short, wide blade, not much longer than its socket, with or without combinations of stepped sockets and pin holes.
(5) Median Ridge on one or both blade surfaces, otherwise very similar to Classic varieties, A-D.
(6) Beveled Blade Edges, some with angled shoulders like the Northern variety.
(7) Northern Variety with a bifacial median ridge and angled shoulders and a rigged back,
(8) Harpoon, with a spur chiseled into the side of the blade, forcing out a barb, converting it into a harpoon head.

Most of the classic variety do not differ greatly one from another, but some few differ significantly with extra long or non oval-like blades. Socket formations are all oval, but vary from simple rolled sockets, independent of the blades to sophisticated sockets that blend into the blade base. Oval sockets range in length, width, depth, and flange (socket sides) thickness. See Figs. 31-33.

Most of the Short Wide Blade (classic D) are probably worn and reworked blades. A few specimens have wide blade-socket proportions, independent of the reworked blade samples. .

The Median Ridge variety is the beginning of a significance variation from the oval or convex to plano-blade surfaces found on all classic varieties. This departure from the norm can also be seen in angled blade shoulders found on some Median Ridge varieties. The bifacial Beveled variety is a another step away form the classic.

The Northern variety is a continuation of this departure from the classic Socketed Ovate. The departure is noted in the angled shoulders, but continues with beveled blade edges and a longer, narrower, more triangular-like blade with a sharper point. The greatest variation in the Northern's rigged back.

All other varieties of the Socketed Ovate (Classic C with no socket excepted) the depth of the socket is partially accommodated with a forced bulge on back side of the specimen. See profile figs. 21-23. The Northern variety projects the socket entirely to the face of the specimen, providing a rigged back. This is the same technology used in crafting the rigged backed Socketed Triangulates.

In several respects, the Northern variety appears to morph toward the Socketed Triangulate. One Canadian variety yet to be studied and classified may be more clearly a separate type, but still closely related to both the Northern Variety of the Socketed Ovate and the Socketed Triangulate type.

Variation In Socket Formation In Relation To Tang Top And Blade Base

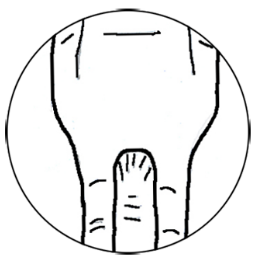


Fig. 30

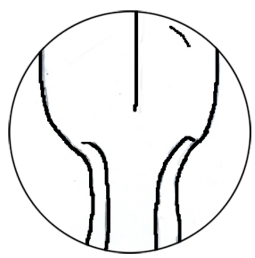


Fig. 31

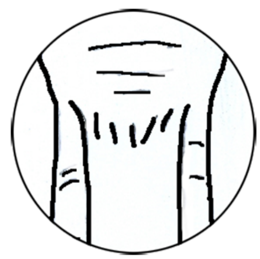


Fig. 32

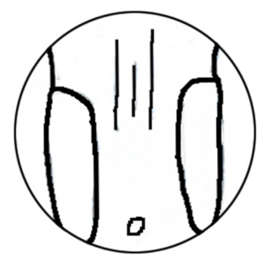


Fig. 33

The relationship between socket formation variation, type variety, and intended use remains unclear. Future research involving a greater sample number will shed additional light on socket formation technology.

Our sample, 18 Socketed Ovate specimens is not sufficiently large to exhaust possible variations. It must be noted, too, that social sciences are not objective sciences, as are physics, chemistry and mathematics. Much of our work is based on subjective observations. Time and oxidation has blurred many of the traits used to classify, to distinguish one variety from another. Median ridges, bevels and other traits become indistinct. Pin holes, always placed near edges of socket butts, oxidize away, as do other distinguishing features.

To counter the built in weakness of a subjective science, we have established a research protocol involving: a precise nomenclature of well defined terms, systematic rules of typology, clear and distinct taxonomic classes, and a methodical procedures for following the rules of logic (Spohn 2007: 5-41). A larger sample of 200 specimens will give us a bette picture of the variations found in the Socketed Ovate. This is the beginning of a research too long ignored.

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Rare Unilateral Three Barbed Copper Harpoon

Period Unknown

Ex Don Boudeman Speciman,
Ex Ed Payne Collection

Some Speculate That Large Heavy, Solid Harpoons Like This one were used For Large Fish

Others Hypothesize That Harpoons As Large And Solid This One Were Used For Beaver And Other Big Fresh Water Animals

Found Near Traverse City, Michigan In The Late 1800's

Quimby Believes Unilateral Harpoons Are Associated With The Red Ochre Cultures, Griffin 1961: 97

The Two Separate Photos Taken Of This Specimen Were Shot At Different Angles and, therefore, One example, or side, Appears Thicker Than The Other.

Prehistoric Copper Artifact Journal

A Production of Great Lakes Copper Research

A Nonprofit Insatiate
Incorporated By The State Of Michigan In 1999

Accomplishments

Great Lakes Copper Research has displayed copper in the Michigan Historical Museum, Lansing, Michigan, the Public Museum of Grand Rapids, the Tri-City Historical Museum, Grand Haven, Spring Lake and Holland, the Muskegon County Historical Museum, and the Coopersville Area Historical Museum. In addition, we have answered questions about copper artifacts for the public viewing our displays and about their own copper artifacts.

Great Lakes Copper Research has sponsored Copper Conferences I, II, III, & IV, 2005-2008. We have produced the Prehistoric Copper Artifacts Journal since 2005 and 33 volumes of the Coffinberry Journal for The Coffinberry Archaeological Society, a Chapter of The Michigan Archaeological Society, September, 2005 through March, 2009.

In addition, we have answered hundreds of questions concerning the prospecting, mining, crafting, trading and use of prehistoric copper. Questions were answered at displays, lectures, and conferences, by phone, US mail, E-mail and Skype.

Finally we at Great Lakes Copper Research have written many research articles, published in various journals. And we have analyzed many prehistoric copper artifacts for individuals, and also for nonprofit institutions of learning and research. Great Lakes Copper Research **analyses** of copper artifacts is free for nonprofit institutions of learning and research.

AWARDS

Best Of The Show – Illinois Archaeological Society
Best Of The Show – Wolverine Archaeological Society
Best Of The Show – The Archaeological Society Of Ohio
Best Of The Show – Indiana Archaeological Society
Best Of The Show – Wolverine Archaeological Society
Editor's Award – Davis–Coffinberry Totem Pole Trophy, 2005-2009


Photo by A. W. Buck.