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KEWA

NEWSLETTER OF THE LONDON CHAPTER, ONTARIO ARCHAEOLOGICAL SOCIETY

c/o Museum of Ontario Archaeology
1600 Attawandaron Road, London, ON N6G 3M6

LONDON CHAPTER OAS

September & October 2016 16-05 & 16-06

The April meeting of the London Chapter OAS will be held on Thursday, April 12, 2018 at the Museum of Ontario Archaeology. The speaker will be **Colin Wallace** (PhD Candidate, Department of Geography and Environmental Management, University of Waterloo). His talk is entitled ***Untapping the Potential of 3D Archaeological Modeling***. Doors open at 7 PM and the meeting will begin at 7:30 PM. All are welcome to attend and as always there is free juice and cookies!!

Speaker's Night is held the 2nd Thursday of each month (January to April and September to December) at the Museum of Ontario Archaeology, 1600 Attawandaron Road, near the corner of Wonderland & Fanshawe Park Road, in the northwest part of the city. The meeting starts at 7:30 pm. Doors open at 7:00 PM and as usual there will be free juice and cookies!

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ANNUAL RATES

Student	$15.00
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As usual we are away behind in issuing KEWAs, largely because of shortfalls in people sending us articles. We do heartily thank however, Kaitlyn Malleau and Tom Arnold who took the time to send us the interesting papers featured in this issue!!

On the Chapter front, please find attached at long last the financial statement, which will get us up to the end of 2016; we should have the 2017 shortly and will put that in an issue as soon as possible. Meanwhile planning is ongoing for the Annual Meeting of the *Ontario Archaeological Society*, which we are co-hosting with the Windsor Chapter on the weekend of November 9-11 in Chatham at the John D. Bradley Convention Centre, a wonderful venue. Several sessions are planned including one focussing on *Black History* and another on *Chatham Kent* archaeology. There will also be a Silent Auction for conference attendees, which is an important fundraiser for the OAS. Through their donations, local businesses can showcase their services and products. We are looking for donations of cultural and/or heritage interest. Please consider donating new or gently used items such as handcrafted items (e.g. jewelry, carvings, paintings, stained glass) archaeology and history books, vintage and antique items, gift certificates, gift baskets, etc. Cash donations are also accepted. To get more information and to make arrangements for drop off or pick up please contact Shari Prowse at archaeologist@rogers.com and Amanda Black at amanda.n.black86@gmail.com .

The Chapter is also planning to continue this year its archaeological surveys in the areas southeast of London around Lake Whittaker and beyond, led by Jim Keron(jkeron5461@rogers.com) and Shari Prowse (see email above) in cooperation with several local landowners and organizations such as the Kettle Creek Conservation Authority. There are many opportunities for volunteers to gets some hands-on experience doing archaeology. Also, our last speaker before the summer break will be on April 12 at the Museum (see cover for details) but remember our annual picnic at Longwoods Conservation Area near Delaware in July – details will be posted on our website (and hopefully in some soon appearing other issues of Kewa) as they arrive!

Onondaga Chert Genesee Style Broadpoints, Davidson Site, Ontario (see following article)

THAT'S THE POINT, MY DEER: AN EXPERIMENTAL STUDY USING GENESEE REPLICA BIFACES

By Kaitlyn Malleau

Introduction

Of all of Ontario's projectile points, the Genesee broad point is among those most recognizable. Used in Ontario between 3800 and 3400 years ago (Ellis et al. 1990, 2009), some of its trademark features include its broad, triangular blade and its rectangular stem. The trait that especially sets it apart from other generally triangular-shaped points, though, would have to be its characteristically large size. The large size of the Genesee biface, as well as other broad point bifaces, has encouraged contentious debate regarding its function. Many researchers have argued that the large size of broad points would impede their use as projectiles (Ellis et al. 1990; also see Cook 1976; Custer 1984, 1991; Snow 1980; Stothers 1983). For that reason, many researchers have begun to accept the explanation that some, or all, of these bifaces were used as knives rather than as weapon tips (see Cook 1976; Custer 1984, 1991; Dunn 1984; Sassaman 2006). Meanwhile, others have remained unconvinced that broad points would have made poor hunting implements (see Funk 1993, Ritchie 1965, Truncer 1990). In 1980, Snow called for a usewear study to be conducted on Genesee bifaces in order to put this debate to rest.

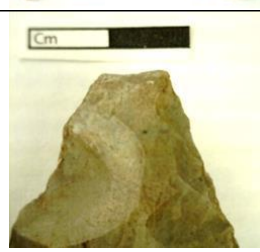
In the completion of the M.A. program at Western University, I decided to conduct a study that would contribute to answering this unresolved question. My goal was to conduct a macroscopic usewear study to determine if, and to what extent, Genesee bifaces were used as projectiles in Southern Ontario. Unlike other researchers who had conducted usewear studies on broad points, however, I did not wish to make use of Ahler's (1971) usewear methodology (see Dunn1984; Funk 1993), but instead apply a method that has become more popular in recent times—Fisher's diagnostic impact fractures.

In 1984, Fischer conducted an experimental study to observe the kinds of fractures that occur when hafted microliths impact various surfaces, as well as if any of these fractures could be used to specifically identify a lithic tool as a projectile. He found that there were in fact five kinds of diagnostic impact fractures (DIFs) that could identify projectile use of a sample of tools (Table 1). Ever since, using the presence of these five types of fractures to identify a lithic tool as a projectile has become relatively common (see Lombard et al. 2004, 2005; Odell and Cowan 1986; Villa et al. 2009; Weitzel et al. 2014). Still, some researchers feel that this method is often uncritically applied to lithic bifaces of various shapes and sizes. Rots and Plisson have recently criticized many macroscopic use-wear studies for not taking into account the diversity of forms present in different projectile point technologies:

> The range of impact features from projectile use, however, depends on the morphology of the point and a single experimental reference to microliths (i.e., Fischer's experiment) cannot simply be transposed to any archaeological situation (Rots and Plisson 2014: 156).

Based on this criticism, in February of 2015, I conducted an experimental study as one facet of my M.A. research. This portion of my research was meant to, firstly, observe the effectiveness of using

Table 1. Macroscopic fracture types

Fracture	Image	Description
DIF: step-terminating bending fracture		"A bending-initiating fracture which before meeting the opposite surface of the specimen runs parallel to this, and which thereafter…meet[s] the surface at a right angle" (Fischer et al. 1984: 23).
DIF: spin-off fracture		''Cone fracture which initiates from a bending fracture and which removes parts of the original surface of the specimen,'' (Fischer et al. 1984: 23).
DIF: impact burin		Hinge fracture along the lateral edge of biface (Odell and Cowan 1986: 204).
DIF: impact flute		A fracture that takes off a narrow tract of material from one of the faces of the point (Odell and Cowan 1986: 204).
DIF: crushing		''[T]he force was directed so deeply into the interior of the stone that it dissipated before it could surface and remove a sizeable piece. As a result… the damage remained localized at the tip itself'' (Odell and Cowan 1986: 204).
undiagnostic fracture: bending fracture		''[I]nitiates from a large area, having a straight or convex profile along its whole area of initiation'' (Fischer et al. 1984: 23)
undiagnostic fracture: cone-initiating fracture		''[I]nitiates from a point or small, well-defined area, having a concave profile in the area of initiation'' (Fischer et al. 1984:23)

large Genesee bifaces in different tasks (as projectiles and as knives), and secondly, to observe the kind of fractures that result from using them in these gestures. The experimental study was meant to confirm whether or not it was reasonable to make use of Fischer's five diagnostic impact fractures when studying larger bifaces.

Materials and Methods

The replica sample included 20 reproduction Genesee bifaces knapped by Dan Long from Onondaga chert (like most of the specimens from the archaeological samples). All of the bifaces were triangular, made of Onondaga chert originating from the geological Clarence Member outcrop near Port Colborne, Ontario (Dan Long, personal communication 2015). They were largely within the range of measurements proposed for Genesee bifaces by Ritchie (1971), Kenyon (1980b), Burgar (1985) and Fisher (1987).

Once I was able to measure the elements of the replica points, Dan Long hafted 15 of the replica points onto hardwood dowels 2.5 cm thick and 120 cm long, and another five of the replicas onto sections of cut wooden dowel 2.5 cm thick and 20 cm long, using an adhesive made from pine resin and beeswax, and rawhide lashings.

The 15 replicas hafted onto dowels 120 cm long were used as projectiles and launched at a deer carcass target. Using a deer carcass was thought to best simulate hunting during the Broad Point period, as it is the only large animal species whose remains have been recovered and identified from the Davidson site (Kenyon 1978, 1980a, b). Additionally, Genesee bifaces were likely used to hunt larger game if used as weapon tips at all (see Malleau 2015). The deer carcass was roadkill, and was frozen for easy storage after collection. The outer tissues (hide, muscle, bone) were thawed by the time of the experiment, though some of the internal organs were still frozen.

For this experiment, like those conducted by Shea and colleagues (2001), Hutchings (2011), and Wilkins and colleagues (2014), the manual speeds of hand-thrown spears were simulated with a bow. In order to launch the projectiles consistently at a particular speed that would be within human javelin-throwing range, we used a bow with a 45 pound (20.4 kg) draw force, and a 28 inch (0.71 m) draw length. I could then estimate the initial speed of the projectile with the equation: $F = \frac{mass\ (speed^2)}{draw\ length}$; where F is the force of launch, and *mass* refers to the mass of the projectile being thrown (the average mass of the spears in this study was 0.279 kg).

The bow we used in this study would have launched the spears at an average initial speed of 23.4 m/s. According to a kinesiology study conducted by Mero and colleagues in 1994, the average speed of a hand-thrown lance was 18.7 m/s for a group of 11 women, and 23.9 m/s for a group of 11 men. A spear projected at a speed of 23.4m/s is therefore well within human hand-thrown speeds—though it is much closer to the average male throwing speed than the average female throwing speed. Wilkins and colleagues also advocate for a speed range between 17 m/s and 27 m/s for thrown spears (2014), and Hutchings used a speed of 25.1 m/s to simulate javelin use in his projectile experiments (2011). Each of the spears were launched from a distance of 2.3 m as many times as was necessary to noticeably fracture. Some lasted as many as four trials before they had even minimal damage and as a result, a total of 29 shots were made at the deer carcass. Each shot was videoed, and each time the spear met the target, its position was photographed. The spears were taken back to the lab and cleaned with detergent and warm water. The stone tips that were heavily damaged were taken out of their hafts, using acetone to remove the adhesive. They were then analyzed then photographed with the use of a Dino Lite digital low-power microscope (between 20 and 50x magnification depending on the size of the fracture) and Dino Capture 2.0 software. The rest had their blades analyzed, but were left within their haft for further trials.

We planned to relaunch those spears that were not heavily damaged (n=7), into a cleared environment, in the hopes that we might observe the fractures that occur when the bifaces struck different materials (rocks, trees, etc). This stage of the experiment was meant to explore the kind of fractures that would occur when the bifaces missed their animal target. The timing of the experiment was unfortunate, however, and in the middle of February it was difficult to find an area without heavy snow cover. In order to observe any impacts at all, we were forced to conduct the experiments on a paved road and launch the projectiles until they broke or were visibly damaged. We took 14 shots on the road, hoping that it would simulate striking stone. Because it became very difficult to control the distance of our spears with the bow, we decided to throw them by hand. Finally, to investigate how the bifaces would break when they struck wood, one spear was launched at a large tree, and a second spear was thrust at a tree twice (there was a total of three trials). All bifaces were used until they sustained heavy macroscopic damage. They were then taken back to the lab, removed from their hafts, and observed once again under the Dino Lite microscope.

The five bifaces hafted on the 20 cm handles were meant to be used as knives to deflesh the deer carcass (though only four out of five were actually used). This part of the experiment was taken on by a total of four individuals, with a maximum of two individuals working on the carcass at once. Two of the individuals, Patricia Wells and Ed Eastaugh were faunal specialists with much experience in defleshing a variety of animals. Patricia Wells even had previous experience using lithic tools for this task. The two others involved were less-experienced students—one of which was myself. Throughout the process, at least one expert was working on the specimen. It took approximately 1 hour and 45 minutes to completely deflesh the deer. First, the carcass was skinned, next the organs were removed, after which the flesh was stripped from the bones. Finally, the vertebral column of the animal was disarticulated at two points, in order to make the sections of skeleton more manageable for further processing (as the bones were to become part of a teaching collection). Again, knives that had been used were taken back to the lab, and washed with detergent and warm water. They were then removed from their hafts and analyzed under the Dino Lite microscope.

Results

The 19 replica Genesee bifaces were used in experimental tasks in order to investigate task-related wear. The Genesee bifaces used as projectile tips displayed four of Fischer's five types of diagnostic impact fractures. There was also some correspondence between the material the biface struck and the resulting impact fracture. Finally, a trend was observed that might suggest that longer replica bifaces fractured more often, giving them shorter use-lives. When the replicas were used as knives for butchering, our activities did not result in any macroscopic fractures. This observation is somewhat different from that of other studies examining fractures resulting from butchering activities.

The Genesee bifaces hafted to spear shafts were launched at the deer target, resulting in 55% of the breaks being diagnostic of impact. Later, the Genesee spears were hand-thrown in an open environment to investigate how the impact fractures would differ based on the material the biface made contact with. While crushed tips were observed under multiple conditions, the other fracture types tended to be especially prevalent in certain circumstances.

The Deer Target

In total, we fired 29 shots at the deer target: two of which glanced off the target, and one of which missed the target completely (in this case the stone point was not observably damaged). Out of the 26 times the spears met their target, the bifaces sustained damage only 11 times (42%). Three of the 11 cases were only very slight tip-crushing events that would not have prevented those points from being reused without repair. Another six cases displayed diagnostic impact fractures (DIFs), meaning that diagnostic impact fractures made up approximately 55% of all macroscopic impact fractures. This figure is in line with the results of the study by Fischer and colleagues (1984), who found diagnostic impact fractures to occur 55% of the time; Lombard and colleagues' 2004 study (57% of the time); and Brindley and Clarkson's 2015 study (60% of the time). Over the course of all trials, the replica projectiles sustained diagnostic impact fractures 21% of the time.

Plate 1. Deer innominate with impact mark (see imbedded chert fragments).

Crushing was the most common impact fracture, occurring a total of 6 times in the deer target experiment (3 of which were not considered diagnostic, as they were so slight; see Table 2). For each of the heavy-crushing events, the projectile landed in the upper forequarter, or hind quarter, suggesting that the point made contact with the scapula or the innominate. In fact, after the deer was defleshed, tiny fragments of chert was found imbedded in the innominate (see Plate 1). It is likely this was caused by one of the crushing events.

Plate 2. Deer vertebrae imbedded with biface tip fragments.

Spin-off fractures were observed twice: each time, the projectile hit the frontal dorsal region, and may have either struck the scapula, or the vertebral column of the animal. An impact burin was observed once when a biface impacted the mid-trunk, likely making contact with the ribs. I observed multiple cone initiated fractures on DLC-11, which made contact with the dorsal trunk—possibly striking the vertebral column. Once again, after the deer was defleshed, two vertebrae were found to have point tips embedded in them (see **Plate 2**).

Table 2. Observations From Launching Replica Points at Deer Target.

	Trial 1	Trial 2	Trail 3	Trial 4
DLC-1	--	--	bending fracture	
DLC-2	spin-off fracture			
DLC-3	--			
DLC-5	--	--		
DLC-6	spin-off fracture			
DLC-7	crushed tip			
DLC-8	crushed (reusable)			
DLC-9	--	--		
DLC-11	impact burin			
DLC-14	crushing at tip; bending fracture at stem			
DLC-15	--	crushed tip		
DLC-17	multiple cone fractures			
DLC-18	--	--	crushed (reusable)	
DLC-19	--	--	--	--
DLC-20	--	--	crushed (reusable)	

These lithic fragments might have been left by any of the spin-off or cone-initiated fracture events. Finally, one bending fracture at the tip was observed (although I believe it was sustained when it penetrated the deer's torso and hit the wooden board supporting the target), and one bending fracture at the stem was observed (the projectile hit the rear of the trunk, possibly striking the innominate).

The Open Environment

When we threw the spears into an open environment, we again observed diagnostic impact fractures. A total of 14 throws were made on the paved road, and impact fractures were sustained 36% of the time (diagnostic impacts, again, occurred 21% of the time). When the tip of the point hit the ground, it was common to see crushing paired with an impact flute (see DLC-5, DLC-18, DLC-19). In the case of DLC-3, in its fourth trial, its shoulder hit the ground, breaking off in a cone-initiated fracture. Finally, for DLC-20, the face of the Genesee point landed on the ground, breaking the biface in two places.

Interestingly, the only impact flutes observed in this experimental study were observed on bifaces thrown onto the road (DLC-5, DLC-18, and DLC-19), while I observed no examples of this kind of fracture on those bifaces launched at the deer target. It could be that impact flutes occur more frequently when the point tip strikes a hard, rock-like surface. Of course the sample size is so small it is difficult to come to any firm conclusions concerning this fracture pattern.

Two of the spears were tested on trees instead of thrown into the open environment. The first, DLC-9, was launched at the tree with the mounted longbow. The stone tip of the spear embedded in the tree and knocked loose from its haft. As we removed the point from the tree, we observed

Table 3. Observations from launching replica points in an open environment.

	Trial 1	Trial 2	Trail 3	Trail 4
DLC-3	--	--	--	crushing and cone fracture on shoulder
DLC-5	impact flute			
DLC-18	impact flute			
DLC-19	--	--	--	impact flute
DLC-20	--	--	--	two bending fractures

that the tip had snapped off the biface. The second spear, DLC-8, was thrust at the tree by hand. The tip of the stone point snapped off as the spear was thrust at the tree for the second time. Each of these tip-snaps was identical to the bending fracture noted on the tip of the biface (DLC-1) that likely made contact with the wooden board that supported the deer target in the first portion of the projectile experiments.

Plate 3. DLC-14 with a bending fracture on its upper stem.

Although this study was relatively small and exploratory in nature, whenever I observed a single bending fracture on a biface, I could associate it with striking wood. Whether the point was launched with the mounted longbow (as in the case for DLC-1 and DLC-9) or thrust against wooden materials (as in the case for DLC-8), if it hit wood, the biface displayed a single bending snap. The one exception was DLC-14, which also displays a single bending fracture, but which struck mammal bone instead. DLC-14, however, did not display a bending fracture at its tip like the other examples (it had a crushed tip), and the bending fracture was found on its upper-stem (see Plate 3). I believe, therefore, that the snapped stem observed on DLC-14 relates to the force from the moving wooden shaft on the biface after the biface had been halted in its trajectory by the mammal bone. In each case, the single bending fracture was caused by a longitudinally-oriented force.

The sole case of a biface sustaining two bending fractures at once (one distally at the tip and one mid-blade) was DLC-20. This biface fractured when one of its faces hit the hard road surface. In this case, the bending fractures were associated with a transversely-oriented force. While this pattern is interesting, it may be difficult to differentiate bending fractures which result from longitudinal force from those that result from a transverse force in the archaeological record.

Size and Uselife

After the trials were completed, I plotted a graph of the relationship between certain measurements of the projectile point and the length of its use-life (measured by the number of trials it survived).

These graphs were meant to investigate the effectiveness of the different sizes and shapes of Genesee bifaces used as projectiles.

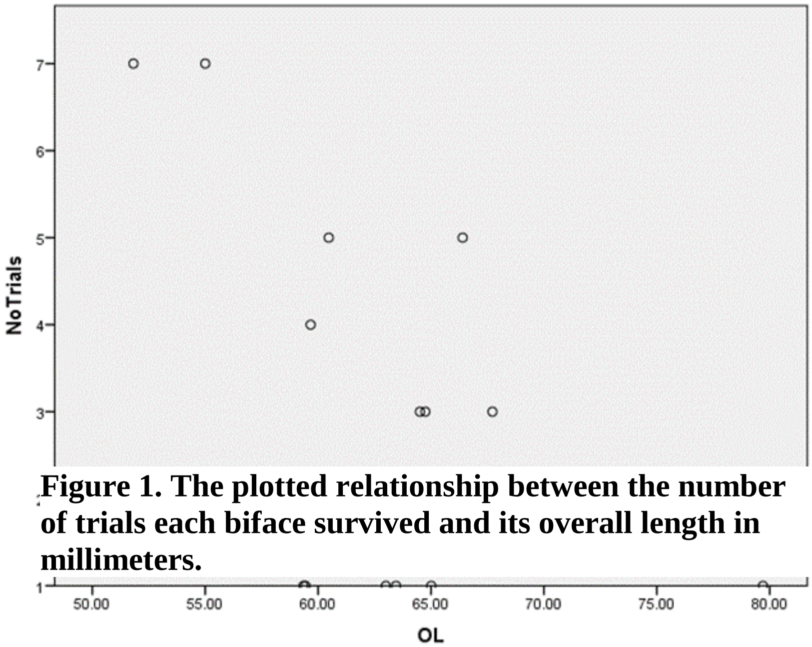


Figure 1. The plotted relationship between the number of trials each biface survived and its overall length in millimeters.

Odell and Cowan (1986) reported that the length of the projectile point made no difference in its longevity in their experimental study, though the length to width ratio did. Even then, they explained that low length to width ratios failed to penetrate the animal's hide more often, and as a result, did not strike bone as frequently as those with higher length to width ratios (Odell and Cowan 1986). Cheshier and Kelly (2006) also conducted an experimental study on the different breakage frequencies between 2.5 cm points and 5 cm points. Again, they did not find that absolute length was a significant factor in durability. In this study, though, the overall length of the projectile point appeared to have been related to the number of trials it survived (see Figure 1). When I plotted the results, a negative relationship between the variables was relatively clear.

A Pearson Correlation found that the relationship was very nearly significant at the ≤0.05 level (Pearson's r=-0.503; p=0.056) suggesting there is some structure to these data. Perhaps the only reason it was not significant at the ≤0.05 level was that the sample was not large enough to resist the variability of different impact surfaces (that is, soft tissue, bone, pavement, and wood)

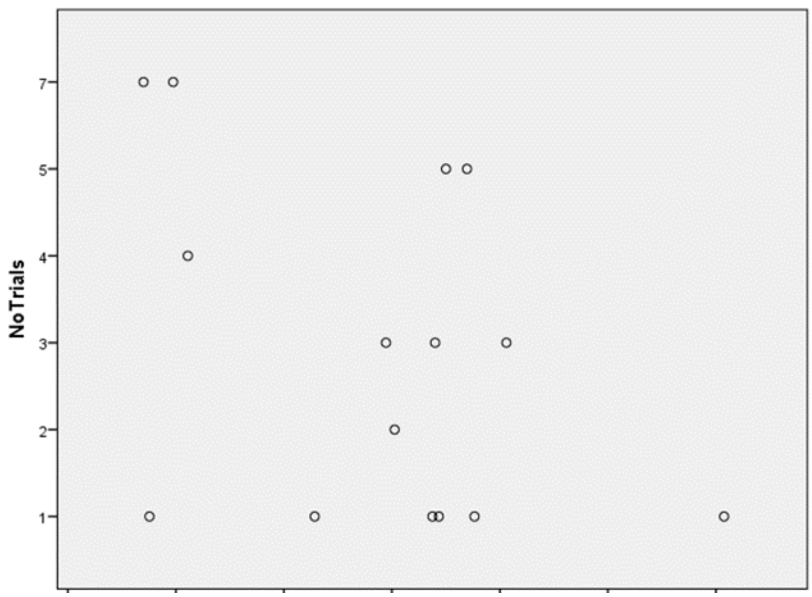


Figure 2. The plotted relationship between the number of trials each biface survived, and its shoulder width.

I conducted the same analysis on the relationship between the longevity to the shoulder width of the projectile point. This relationship was far less defined when plotted (see Figure 2), and it was not significant according to its Pearson Correlation (Pearson's r=-0.449; p=0.093).

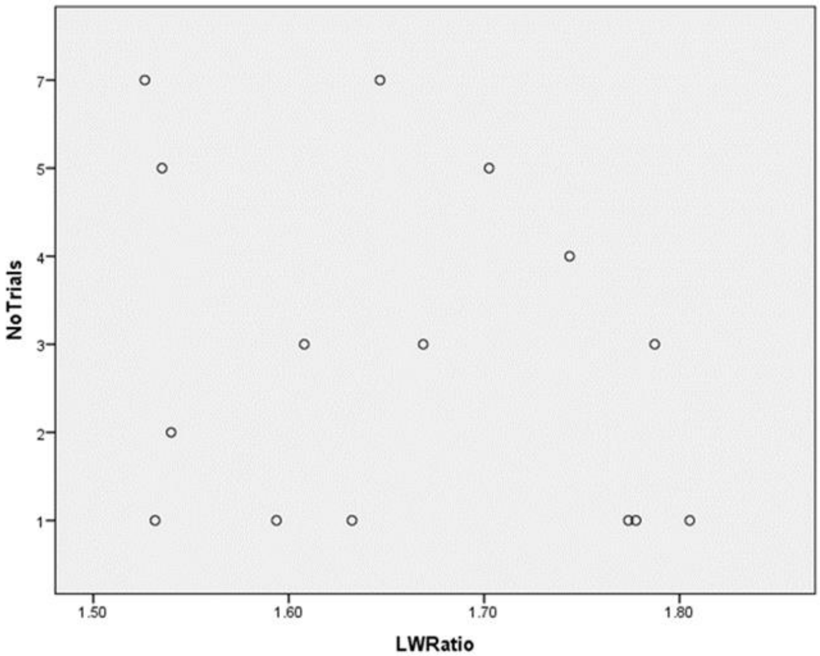


Figure 3. The plotted relationship between the number of trials each biface survived and its length to width ratio.

Finally, I repeated the same steps once more, this time testing survival rate to the length to width ratio of the projectile point (see Figure 3). There was, seemingly, no relationship between the plotted variables, and the lowest Pearson Correlation significance score (Pearson's r= -0.277; p=0.318). The failure of the length to width ratio to correlate with projectile survival seems contradict the findings of other studies, but it is interesting that the length of the biface appears to have had influence on its durability.

None of the four Genesee knives used to deflesh the deer carcass sustained macroscopic fractures. The greatest change that I observed was a general rounding of the tip and edges. At one point, a stone biface came loose from its haft—though it sustained no observable damage from the event. While Truncer (1990) observed fractures on all the blades of his knives after his butchery experiment using Perkiomen style broad points, we were not able to replicate his results with the Genesee bifaces. Because the four Genesee knives in this study had a larger width to thickness ratio ($\bar{x}$= 5.5) than Truncer's three replica Perkiomen knives ($\bar{x}$= 4.4), I do not believe that the Perkiomen replica bifaces were easier to break under transverse stress. I believe it is more probable that these differences relate to the experience of the researchers who were involved in the defleshing experiment. The researcher who did most of the defleshing for this study, Patricia Wells, had previous experience using lithic tools for this task, and was aware that using the knife in a twisting or prying motion would break the tool. Ed Eastaugh, the technician who runs the zooarchaeology laboratory at Western University, has also had much experience in defleshing animals. Even when he disjointed the vertebral column in two places, the knives did not break. Truncer (1990) meanwhile claims to have employed a prying technique to disjoint elements in his own experiment, and found that each of his three knives sustained transverse fractures across their blades.

Additionally, those researchers who conducted most of the defleshing in this study were not aware of the kinds of breaks commonly observed on Genesee material, nor were they aware of my own expectations. It is possible that Truncer (1990), in contrast, had some idea of the kinds of fractures present on the archaeological bifaces, leading him to re-create what he had observed (consciously or subconsciously).

If past peoples did use Genesee bifaces as knives, it is more likely that they were well-practiced in their use, and were aware of the consequences of using them in certain gestures. Truncer's study determined that transverse blade fractures are a possibility when using broad-shouldered, thin-bladed bifaces in butchering activities, but the results of the present study suggest that it was not an unavoidable consequence. Instead, when investigating the use of these bifaces as knives in the future, one must conduct a microscopic use-wear study—either in lieu of the macroscopic study, or in combination with it.

Conclusions

Based on these experiments, it would seem that it was not only possible for past people to have used Genesee technology for hunting, but that the technology would have worked very well for this purpose. More than that, four out of the five of Fischer's (1984) diagnostic impact fractures were observed on the replica Genesee bifaces after use in our study. Therefore, if people *were* using Genesee technology to tip lances or thrusting spears, it would be possible to identify that in the archaeological record using his methods. It would also seem that Genesee technology would have worked very well as knives, and that despite the results of Truncer's (1990) study, it would not have necessarily always resulted in transverse bending fractures.

In the course of the study, some unexpected patterns were observed. First, it seemed that bending fractures resulting from longitudinally-oriented forces were especially associated with impacting wood. Second, despite previous studies finding no significant relationship between a projectile point's length and its uselife (see Odell and Cowan 1986, Cheshier and Kelly 2006), this study would suggest that these variables may be related—at least within the Genesee length-range.

It should be noted that the research in this study has certain limitations. First of all, it is well known that experimental studies can only act as approximations of past events, and that they are never perfect simulations. Because the experiment was performed in February, in the midst of Canadian winter, the bow was set up relatively close to the deer target—and likely closer than what would be observed in the average hunting scenario—in order to perform the test inside a garage. For the same reason, for the open-environment trials, the projectiles were thrown onto a paved road instead of an open field, or a wooded environment. While the resulting correlation between specific impact fractures and surfaces of impact is interesting, it does need further study. I recommend that before these observations can be used to investigate the archaeological record, more trials using a larger sample, and a greater variation of launch speeds and distances is conducted.

Acknowledgements: As is the case for most experimental research, this study was only made possible with the help of several individuals for whose help I am so grateful! A big thank you goes out to my M.A. thesis supervisor Chris Ellis, the Lab Manager at Western University Edward Eastaugh, and the volunteers who helped me: Darryl Dann, Patricia Wells, and Tessa Plint.

References Cited

Ahler, Stanley A.
1971 *Projectile Point Form and Function at Rodgers Shelter, Missouri*. Missouri Archaeological Society, Columbia.

Burgar, Robert W.
1985 *Points To Ponder: A Regional Analysis of the Batten Kill Phase in Southern Ontario.* M.A. thesis, Department of Geography, York University, Toronto.

Brindley, Jared, and Chris Clarkson
2015 Beyond A Suggestive Morphology: Were Wardaman Stone Points Exclusively Spear Armateurs? *Australian Archaeology* 80:81-92.

Cheshier, Joseph and Robert L. Kelly
2006 Projectile Point Shape and Durability: The Effect of Thickness:Length. *American Antiquity* 71(2): 353-363.

Cook, Thomas
1976 Broadpoint: Culture, Phase, Horizon, Tradition, or Knife? *Journal of Anthropological Research* 32:337-357.

Custer, Jay
1984 The Palaeoecology of the Late Archaic: Exchange and Adaptation. *Pennsylvania Archaeologist* 54(3-4):33-47.
1991 Notes on Broadspear Function. *Archaeology of Eastern North America* 19:51-74.

Dunn, Robert, A.
1984 Form and Function of the Perkiomen Broadpoint. *Pennsylvania Archaeologist* 54(3-4):11-18.

Ellis, Chris, J., Ian T. Kenyon, and Michael W. Spence
1990 The Archaic. In *The Archaeology of Southern Ontario to A.D. 1650*, edited by Neal Ferris and Chris J. Ellis, pp. 65-124. Occasional Publication of the London Chapter, OAS, No. 4. London.

Ellis, Chris, Peter Timmins, and Holly Martelle
2009 At the Crossroads and Periphery: The Archaic Archaeological Record of Southern Ontario. In *Archaic Societies: Diversity and Complexity across the Midcontinent*, edited by Thomas Emerson, Dale McElrath and Andrew Fortier, pp. 787-837. State University of New York Press, New York.

Fischer, Anders, Peter Vemming Hansen, and Peter Rasmussen.
1984 Macro and Micro-Wear Traces on Lithic Projectile Points: Experimental Results and Prehistoric Examples. *Journal of Danish Archaeology* 3:19–46.

Fisher, Jacqueline A.
1987 Brodie and Parkhill: An Analysis of Two Late Archaic Broadpoint Samples from Southwestern Ontario. *Kewa* 87(8):3-21.
1997 *The Adder Orchard Site: Lithic Technology and Spatial Organization in the Broadpoint Late Archaic*. Occasional Publications of the London Chapter, OAS, No. 5. London.

Funk, Robert E.
1993 *Archaeological Investigations in the Upper Susquehanna Valley, New York State.* Persimmon Press, Buffalo.

Hutchings, Karl W.
2011 Measuring Use-Related Fracture Velocity in Lithic Armatures to Identify Spears, Javelins, Darts, and Arrows. *Journal of Archaeological Science* 38(7):1737-1746.

Kenyon, Ian
1978 *The 1977 Salvage Excavations at the George Davidson Site (AhHk-54).* Conservation Archaeology Report Number 3, Southwestern Region, Historical Planning and Research Branch Ministry of Culture and Recreation, London Office.

1980a The George Davidson Site: An Archaic "Broadpoint" Component in Southwestern Ontario. *Archaeology of Eastern North America* 8: 11-28.

1980b The Satchell Complex in Ontario: A Perspective from the Ausable Valley. *Ontario Archaeology* 34:17-43.

Lombard, Marlize

2005 A Method for Identifying Stone Age Hunting Tools. *The South African Archaeological Bulletin* 60 (182): 115-120.

Lombard, Marlize, I. Parsons and M.M. van der Ryst

2004 Middle Stone Age Lithic Point Experimentation for Macro-Fracture and Residue Analyses: The Process and Preliminary Results with Reference to Sibdu Cave Points. *South African Journal of Science* 100: 159-166.

Malleau, Kaitlyn

2015 *Practice Makes Projectiles: Genesee Biface Technology in Southern Ontario.* M.A. thesis, Department of Anthropology, University of Western Ontario, London.

Mero, Antti, Paavo V. Komi, Tapio Korjus, Enrique Navarro, and Robert J. Gregor

1994 Body Segment Contributions to Javelin Throwing During a Final Thrust Phases. *Journal of Applied Biomechanics* 10:166-177.

Odell, George H. and Frank Cowan

1986 Experiments with Spears and Arrows on Animal Targets. *Journal of Field Archaeology* 13:195-212.

Ritchie, William A.

1971 *New York Projectile Points: Typology and Nomenclature*, Revised Edition New York State Museum, Albany.

1965 *The Archaeology of New York State*. The Natural History Press, New York.

Rots, Veerle and Hugues Plisson

2014 Projectiles and the Abuse of the Use-Wear Method in a Search for Impact. *Journal of Archaeological Science* 48:154-165.

Sassaman, Kenneth E.

2006 *People of the Shoals*. University Press of Florida, Gainesville.

Shea, John

2001 Experimental Tests of Middle Palaeolithic Spear Points Using a Calibrated Crossbow. *Journal of Archaeological Science* 28:807-816.

Snow, Dean

1980 *The Archaeology of New England*. Academic Press, New York.

Stothers, David M.

1983 Radiocarbon Dating the Satchell Complex in Northwestern Ohio. *Ohio Archaeology* 33(2):29.

Titimus, Gene L., and James C. Woods

1986 An Experimental Study of Projectile Point Fracture Patterns. *Journal of California and Great Basin Anthropology* 8(1):37-49.

Truncer, James J.

1990 Perkiomen Points: A Study in Variability. Experiments and Observations on the Terminal Archaic of the Middle Atlantic Region. In *Experiments and Observations on the Terminal Archaic of the Middle Atlantic Region,* edited by Roger W. Moeller, pp. 1-62. Archaeological Services, Bethlehem, CT: 1-62.

Villa, Paola, Paolo Boscato, Filomena Ranaldo, Annamaria Ronchitelli
2009 Stone Tools for the hunt: points with impact scars from a Middle Paleolithic site in Southern Italy. *Journal of Archaeological Science* 36:850-859.
Weitzel, Celeste, Nora Flegenheimer, and Mariano Colombo
2014 Breakage Patterns on Fishtail Projectile Points: Experimental and Archaeological Cases. *Ethnoarchaeology* 6(2):81-102.
Wilkins, Jayne, Benjamin J. Shoville, and Kyle S. Brown
2014 An Experimental Investigation of the Functional Hypothesis and Evolutionary Advantage of Stone-Tipped Spears. *PLOS ONE* 9(8): 1-13.

HEY BOSS, IS THIS AN ARTIFACT?

By Tom Arnold

If you have spent any time in archaeology the question: 'Hey Boss, is this an artifact?' (or something along those lines) has either been uttered by you or asked of you. This article describes two such objects that could be found on archaeological sites in the Great Lakes region and that may either be misinterpreted or not recognized as cultural in nature. Thus what follows are two examples of archaeological visibility at the scale of the artifact. The hint that these potential artifacts may be found on archaeological sites did not come directly from the archaeological record itself but from oral tradition/folklore (Luck Stone) and from 17th century written accounts (Erie Stone).

Lucky Stones

According to Wikipedia (2017a) a'lucky stones is the otolith (ear bone) of the freshwater Drum fish (or sheepshead fish, *Aplodinotus grunniens*). In the Drum fish these bones are relatively large and tend to appear polished and ivory-like and are commonly found on the beaches of the Great Lakes, Lake Erie in particular. The have a natural groove that looks like the letters 'L" (left side otolith) and "J" (right side otolith) (Plate 1). These bones not only help with hearing but the groves, known as 'sulcus', are located next to neuromast cells and together with the grooves they provide the fish with information about its body's orientation through changes in pressure as the fish moves (Wikipedia 2017a).

Considered one of the most wide ranging species of freshwater fish in North America, they range from Hudson Bay to Guatemala and from the eastern Appalachians to Texas, Oklahoma and Kansas (Wikipedia 2017 b). Yet it appears that the Great Lakes area was the main sources of these 'Lucky Stones'. This could be due to the fact that the Great Lakes provided a larger habitat and thus larger population of fish in Pre-Contact and Early Historic period. Once the fish died and decomposed the otoliths would wash ashore were miss-identified and collected as pebbles. Why they were seen as unique or special is pure speculation but it could relate their polished ivory appearance and natural grooves (Wikipedia 2017a).

***Plate 1*. Examples of Lucky Stones (Drum/Sheepshead's otoliths).**

Considered to be lucky by First Nations peoples as a protective amulets, they were apparently traded in Pre-Contact times as far afield as Utah and California (Wikipedia 2017a). In fact, they are still being used in the making of jewelry, such as earrings and necklaces (Plate 2). According to Hudson (2016), there is a tradition among Great Lakes fishermen and sailors of keeping these otoliths as lucky charms to "...to keep them safe from storms, to give them an edge in a card game, or for better luck with the ladies."

As I see it, there are two problems with these objects occurring on archaeological sites. The otoliths might be misinterpreted as a smooth oddly shaped pebbles or stones and not kept; or, if recovered they may been seen as evidence of the consumption of Drum and included in the faunal analysis and not as evidence of a belief system.

Correcting for the former can only really be done through the education of archaeological field technicians (workers) on what to look for and to reinforce the old archaeological adage 'if you are not sure keep it.' Of course this can become problematic, in that one may end up with bags of smooth pebbles from inexperienced personal who are uncertain or afraid of throwing away something important.

The latter problem may be easier to remedy because the context of the where the Lucky Stone is found may be a clue as to its use. First, if there is no other fish bones or more specifically Drum fish bones then it might be reasonable to consider alternative explanations for their occurrence on site. Second, if the Luck Stone has been drilled to allow it to be threaded than this would suggest it was worn as an amulet or attached to clothing. One should keep in mind though, that it is possible these items were kept in pouches or pockets, as is reported for historic period Great Lakes sailors (Hudson 2017), and thus may not show any obvious evidence of human alteration.

Plate 2. **Lucky Stone made into modern jewelry.**

Erie Stones

The second artifact that could be mistaken for a naturally occurring object on an archaeological site is an 'Erie Stone'. Erie Stones or "pierres Erienes" is a term used to describe a rock or mineral used in First Nations traditional medicine. Francois Gendron, the French Jesuit surgeon at Sainte Marie Among the Hurons mission, first described its use in the 1640s in letters later published in 1660 (Gendron and Recoles 1660). Gendron described the sources of these stones as being at the base of Niagra Falls and that a local First Nations group settled there and traded this item to other communities. The ointment created from this rock was said to help the healing of "wounds, fistulas and malignant ulcers (...pour la curation des playes, fiftules, & ulceres malignes...) (Gendron and Recoles 1660:7-8). Gendron original published description of Erie Stones and a translation by Mr. Francis Carson are as follows:

> De la Nation Neutre, tirant prefque au Midy, on trouue vn grand lac, quafi de deux cent lieuè's de tour, nommé Erié, qui fe forme de la décharge de la Mer-Douce, & qui va fe précipiter par vne cheute d'eau d'vne effroyable hauteur dans le troifiéme lac, nommé Ontarié, que nous appelions le lac S. Louis. De l'efcume de ces eaux bondilTantes aux pieds de certains grands rochers qui fe rencontrent en ce lieu, fe forme vne pierre, ou pluftoft vn fel petrijfiée, de couleur tirant vn peu fur le jaune d'vne admirable vertu, pour la curation des playes, fiftules, & vlceres malignes. Dans ce lieu plein d'horreur habitent auffi certains Sauuages, qui ne viuent que des Ellans, des Cerfs, des Vaches fauuages, & toutes autres fortes de gibier, que le rapide entraifne & bouleuerfe dans l'entre de ces Rochers, où ils en attrapent fans courir, plus que fuffifamment pour leur prouilion, & l'entretien des palfans, aufquels ils traittent auffi de ces pierres Erienes, ainfi nommées à caufe de ce lac, pour les porter & diftribuer puis après aux autres Nations. Ce lac nommé Erié, eftoit autresfois habité en ces coftes qui font vers le Midy, par certains peuples que nous nommons la Nation du Chat, ainfi nommées pour la grande quantité de Chats (Gendron and Recoles 1660:7-8)
>
> To the south of the Neutral Nation is found a very large lake, almost two hundred leagues around, called Lake Erie, which forms the outlet from Lake Huron and which precipitates over a waterfall of frightening height into the third lake named Ontario but which we used to call Lake St. Louis. A particular feature of the foam formed by these surging waters at the foot of huge rocks which come together here is a kind of stone or petrified salt, yellowish in colour, having the wonderful quality of curing wounds, fistulas and malignant ulcers. This frightening place is inhabited by savages who subsist only on moose, deer, elk, wild cattle [Bison?] and other kinds of wild game which are caught up in the rapids and cast down amongst the rocks, where they catch them without having to hunt. This is more than sufficient for their own needs and for supplying passers-by with whom they also trade these so-called Erie stones, named after this lake, in order to distribute them to other Nations. The southern shore of the lake called Erie was formerly inhabited by a people whom we call the Cat [Raccoon] Nation because of the large number of cats [raccoons].

Exactly what the rock was that this ointment was made from has been open to debate since Gendron first described it. As the quote above reveals he described the rock as a yellowish salt formed from the petrification of foam formed at the foot of Niagara Falls (Gendron and Recoles 1660:7-8). It is generally believed that Gendron did not actually visit the area and collect the samples himself but that he obtained the samples and the description from intermediaries, probably Native American traders (Hunter 1985:3), although Jury and Jury (1954:106) believe he traveled extensively throughout the Great Lakes region.

Jury and Jury (1954:107) interpreted Gendron’s description as describing calcareous tufa, a rock formed by precipitation from supersaturated limestone deposits. Hunter (1985), however, identified it with aragonite, a crystalline form of calcium carbonate, with inclusion of magnesium sulphate and calcium sulphate.

In essence, both are correct but Hunter's is more precise. Tufa is predominately calcite but can also be aragonite, both are different mineral forms of calcium carbonate, and can form near waterfalls because of the increase interaction between air and water that enhances the supersaturation of the calcium carbonate (Wikipedia 2018a). Hunter suggests that the source of the Erie Stone (aragonite, magnesium sulphate and calcium sulphate) was more likely due to seepage. His exact explanation is as follows:

> The mineral is formed on the rock walls of the Niagara gorge as a result of water seepage through the numerous layers of limestone bedrock...the uppermost layer of the Niagara Escarpment is dolostone. This a sedimentary rock composed of calcium and magnesium carbonate ($CaMg(CO_3)_2$). Rainwater which is normally slightly acidic seeps through the dolostone dissolving some fo the carbonate minerals, and changing them to bicarbonate form. In this way they are water soluble and are picked up and carried by the water
>
> Below the dolostone layer is a shale layer known as the Rochester shales. The water seepage does not penetrate through this layer, so it flows horizontally along the layers of dolostone which outlet at the Niagara gorge and run down the side of the rock face. Because of evaporation of some of the water, calcium carbonate and the mineral aragonite are produced.(Hunter 1985:4)

Gendron's visual description of a yellowish coloured salt best fits the description of aragonite. As a crystalized form of calcium carbonate it might appear salt-like (see Plate 3) and yellow is one of its many colours (Wikipedia 2018b).

Plate 3. **Aragonite Crystal (By Didier Descouens - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=10799189**

The question then is, does this aragonite, magnesium sulphate and calcium sulphate have any known medicinal qualities. The following discusses this for each separate mineral (also see Hunter 1985:7).

Aragonite: Its primary use is in aquariums to help replicate reef conditions by keeping the pH level of the water close to neutral. It has also been used to remove zinc, cobalt and lead from wastewater (Wikipedia 2018b).

Calcium sulphate (Gypsum): Its primary use is in the making of plaster of Paris. When powdered and then hydrated and hardened it forms a hard crystalline structure that is not easily soluble in water after it hardens. It has also been used as a coagulant for food products such as tofu (Wikipedia 2018c).

Magnesium sulphate: This mineral is more commonly known as Epson Salt and of the three potential Erie Stone minerals the only one currently known to have medicinal usage. It is used both internally by taking it orally or intravenously, as well as externally such as in bath salts. Oddly the claimed health benefits of Epson salt baths, relieving the ache of sore muscles, has never been scientifically proven (Wikipedia 2018d, Ingraham 2017). It has other uses in agriculture, chemistry, aquariums (where like aragonite neutralize pH levels) and in food preparation. Like Calcium Sulphate it is used as a coagulant in the making of tofu (Wikipedia 2018e).

Medicinal Discussion and Speculation

The following discussion is purely speculative on my part as I am not trained in medical science. Although none of the above minerals are currently known to help heal open wounds, it is likely that this three mineral compound identified by Hunter is the Erie Stone mentioned by Gendron.

One has to wonder if the coagulating effects noted for both Magnesium and Calcium sulphates in the food industry are effective on open wounds. Or if the Calcium Sulphate part of the compound once applied and dried forms a hard bandage that protects the wound from further infection and injury. Finally, does the pH neutralizing effect of both Aragonite and Magnesium sulphate also help in the healing process, since the surface pH of chronic wound areas tends to be alkaline or base which prevents healing and neutralizing this helps with healing (Gethin 2007).

The fact that this traditional First Nation compound was in demand and was a trade item prior to European contact and that after Gendron returned to France with it he became both famous and wealthy because of its use (Dictionary of Canadian Biography 2018), suggests that at the very least people thought it worked to heal stubborn wounds. It is also unknown whether Gendron recognized that Erie Stone contained the same mineral as that produced in Epson, England, from which the salt derives its name. The purported medicinal properties of which were first noted in 1618, or about 30 year prior to Gendron's use (Wikipedia 2018d).

Erie Stone Conclusion

So what would an Erie stone look like if uncovered on an archaeological site? To my knowledge no sites have been identified within the Niagara Gorge that could belong to any First Nations group living there and mining Erie Stone. Hunter (1985:4) notes that this group probably belonged to the Neutrals.

It is hard to know in what form this substance was transported or whether it was in large bulk samples or not. If one presumes that once removed from the walls of the gorge some crushing or processing might occur to allow for easier bulk transport, than bulk samples might look like a yellowish to whitish poorly consolidated or disintegrating rock. The aragonite and magnesium sulphate might give it a crystal or salt like appearance but if the calcium sulphate was present and had become wet and then dried then a less crystalline like mass may be present, thus the disintegrating rock appearance. Smaller samples may be harder to identify.

There is a geological tests using a weak solution of hydrochloric acid (5% - 10%) used to determine if a rock has calcium carbonate in it. This should only be tried by someone familiar with the test and taking the appropriate precautions. Aragonite will produce a strong reaction when a drop of acid is placed on it. A safer a less vigorous reaction can occur using vinegar. See King (2018) for a discussion and description of the acid test.

Conclusion

The ability to properly identify these two artifacts in the archaeological record is difficult but not impossible. Their correct identification provides us with a fuller understanding of the past in general and of Pre-Contact and early Post-Contact beliefs and pharmacology in the Great Lakes region in particular.

Both of these items were traded and were apparently sought after. Lucky Stones were traded as far as the Utah and California but what came back along that trade route is not yet known. As the translated paragraph above states, Erie Stone was collected and traded to other First Nations groups who in turn traded them down the line. There is no indication as to the extent or range (we know it went has far a Huronia) of the Erie Stone trade but the fact that a community could successfully exist and thrive off the proceeds of this trade suggests that it may have been both lucrative and extensive.

Making the artifacts visible to us as archaeologist obviously poses many new questions and lines of enquiry. How do they influence our interpretation of particular a site and the past in general. What more can it tell us about the people and cultures that used them? Finally, what other material culture hints exist in our oral traditions/folklore (both First Nation and Euro-Canadian) and early written historical accounts that could help us understand the past.

Acknowledgments: I would like to thank the late Mr. Francis Carson who retranslated the 17th century passage from Gendron as well as the assistance of Dr. Robert Pearce.

References Cited

Dictionary of Canadian Biography
2018 Gendron, Francois, http://www.biographi.ca/en/bio/gendron_francois_1E.html (Accessed January 30, 2018).
Gendron, Francois and Jean-Baptiste de Recoles
1660 Quelques Particularitez Du Pays Des Hurons En La Nouvelle France. Republished in 1868 and 2013 E-Books Delivery Service, Cleveland, Ohio, USA
Gethin, Georgina
2007 The significance of surface pH in chronic wounds. *Wounds UK* 3(3):52-56.
Hudson, William
2017 Lucky Stones. Neo-Naturalist.com. http://www.neonaturalist.com/nature/lucky_stones.html (Accessed February 6, 2018)
Hunter, James
1985 Erie Stone: A Seventeenth Iroquoian Medicinal Trading Commodity. *Kewa* 85(2):2-8.
Ingraham, Paul
2017 Does Epson Salt Work? https://www.painscience.com/articles/epsom-salts.php (Accessed February 8, 2018).
Jury, Wilfred and Elsie McLeod Jury
1954 *Sainte-Marie Among the Huron.* Oxford University Press, Toronto.
King, Hobart M
2018 The "Acid Test" for Carbonate Minerals and Carbonate Rocks, https://geology.com/minerals/acid-test.shtml (Accessed February 16, 2018).
Wikipedia
2017a Lucky Stones, https://en.wikipedia.org/wiki/Lucky_stone (Accessed June 14, 2017).
2017b Freshwater Drum, https://en.wikipedia.org/wiki/Freshwater_drum (Accessed June 22, 2017).
2018a Tufa, https://en.wikipedia.org/wiki/Tufa (Accessed January 11, 2018).
2018b Aragonite, https://en.wikipedia.org/wiki/Aragonite (Accessed January 23, 2018)
2018c Calcium sulfate https://en.wikipedia.org/wiki/Calcium_sulfate (Accessed January 23, 2018)
2018d Magnesium sulfate (medical use) https://en.wikipedia.org/wiki/Magnesium_sulfate_(medical_use) (Accessed February 8, 2018).
2018e Magnesium sulfate https://en.wikipedia.org/wiki/Magnesium_sulfate (Accessed January 29, 2018)

The Ontario Archaeological Society Inc.

Chapter financial report

Year Ending: December 31st, 2016

Chapter **London Chapter**

Income and Expenses

	2016	2015
BANK BALANCE - START OF YEAR	12,262.44	12,153.32

PLUS - CASH RECEIPTS

	2016	2015
Membership Income		
Member Dues	1,081.49	1,010.50
OAS Dues collected	0.00	
Publication Sales		
19th Century Notes	0.00	
Book Sales	0.00	101.00
CD/DVD Sales	760.31	834.55
Miscellaneous Revenue - Other	0.00	
TOTAL RECEIPTS	1,841.80	1,946.05

LESS - CASH PAYMENTS

	2016	2015
Operations		
Bank Charges	1.50	
Cookies/Juice	166.04	120.62
Kewa Mailing	951.77	571.68
Kewa Printing	665.61	424.71
OAS Dues Paid	0.00	
Postage, Mailing Service	0.00	
Rent, Parking, Utilities	400.00	400.00
Speaker Dinner	131.77	52.24
Other Costs	167.96	0.00
Publications Costs		
CD/DVD Materials	86.92	
Pubs Mailing - books	0.00	13.87
Pubs mailing - CD/DVD	60.88	253.81
TOTAL PAYMENTS	2,632.45	1,836.93
BANK BALANCE - YEAR TO DATE/ END OF YEAR	11,471.79	12,262.44