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NEWSLETTER OF THE LONDON CHAPTER,
ONTARIO ARCHAEOLOGICAL SOCIETY
c/o Museum of Ontario Archaeology
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The next get-together of the London Chapter will be our **Annual Picnic**, as always to be held in conjunction with **Archaeology/Artifact Day at the Longwoods Conservation Area west of Delaware, Ontario**. It will be held on **Sunday, July 17 2016 beginning at 11:00 AM**. London Chapter members will get **free admission** so **do not purchase a ticket at the automated machine at the gate**. Rather follow the entrance road to the resource centre in the Conservation Area where you can pick up a ticket for display in your vehicle and then park in the lot just to the north of the centre. All you need is your picnic lunch including beverages! There will be a barbecue if you need it and there is always some extra free food like hot dogs. London Chapter members will identify artifacts brought in by the general public and there is always a chance to try one's hand at flint-knapping and such -- see details of the archaeology event and how to get to the Conservation area here: http://www.lowerthames-conservation.on.ca/events/artifact-day/ See you there!**.**

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 8:00 pm. Doors open at 7:30 PM and as usual there will be free juice and cookies!

ANNUAL RATES

Student	$15.00
Individual	$18.00
Institutional	$21.00
Subscriber	$20.00

Chapter Executive

Jack's Reef and Related Point Types in Ontario: A Reappraisal

by Jeff Bursey

INTRODUCTION

Several years ago I was honoured to be asked to represent Ontario in a symposium summarizing what is known about Jack's Reef and related projectile point styles (Figure 1). Unfortunately at the time I had difficulty pulling together a viable paper and ultimately I was unable to attend the symposium for other reasons. Nonetheless, I did begin reviewing the available information and had started to arrive at some conclusions that I found to be surprising. When the results of the symposium were subsequently published (Halsey 2013), however, I found that some of my suspicions were in line with other researchers from other regions. After thinking these over, I decided to offer my thoughts here.

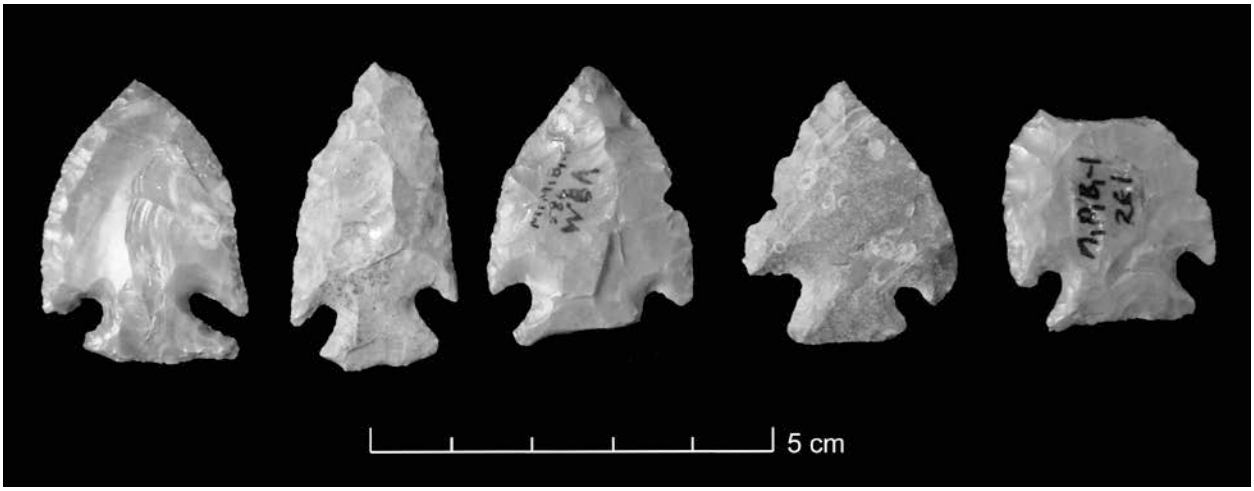

Figure 1: Jack's Reef Points from Brodie, Welke-Tonkonoh and other Sites in Southwestern Ontario. University of Western Ontario Collections. Photo by Edward Eastaugh.

In the following, therefore, I will review the information available on Jack's Reef and related hafted biface styles in southern Ontario. Since there have been few or no new descriptions of Jack's Reef bifaces, let alone assemblages, from southern Ontario since the "classic" typological publications (Justice 1987; Ritchie 1971), there is little reason to undertake a detailed review of projectile point metrics or attributes. Instead, a focus on some of the non-metric attributes that researchers rely on to identify these tools may be of use in addressing some specific problems that I believe to be of interest. For example, I think one problem we are confronted with is that hafted bifaces from other times are at least occasionally typed as Jack's Reef and, alternatively, Jack's Reef bifaces may not be recognized as such and assigned to different technological traditions. Both will impact our ability to address questions relating to the distribution of these artifacts in space and time.

I also want to take into account that there is a cluster (*sensu* Justice 1987) of related projectile point styles that appear to be contemporaneous with Jack's Reef. If we can account for the similarities and differences between these types and/or variants, we may be able to get closer to gaining an understanding of why these appear when they do and what the underlying processes leading to this congruence of styles might have been. One common trope holds that changes in attributes of the hafting section might have been causally correlated with a change in the projectile launching technology (Wright 1995) or, more simply, increased stress during the use of hafted bifaces as knives (Ellis 2004). Similar arguments pervade the

recent synthesis with the argument being that the appearance of the Jack's Reef style correlates with the appearance of the bow although these ignore arguments for the appearance of the bow (and arrow) much earlier in time.

A long-recognized complication is that lithic production and use is a continuous process that can result in artifacts being discarded or redirected to alternate uses at any point in the manufacturing sequence and this can result in a considerable amount of variability (Flenniken and Raymond 1986; Rondeau 1996). Relevant here is the recognition that some "types" may be unfinished preforms that entered the archaeological record for any number of reasons. The Jack's Reef projectile point "cluster" (following Justice 1987) includes Jack's Reef Pentagonal, which many argue falls into this preform category although others maintain that it was a distinctive functional or culture-historical type. The Brewerton cluster also includes different types that are argued to have resulted from changes due to re-sharpening or fixing minor damage (e.g. Ellis and Deller 1986:50). The edge trimming of the Brewerton Corner-notched type, for example, would have produced the Brewerton Side-notched and, ultimately, Brewerton Eared. Thus, the three types actually represent a continuum produced through re-sharpening the lateral fore-section edges.

Finally some bifaces may have been recycled for other uses and thus are identified as hafted scrapers/bunts, knives or drills. The potential for a hafted biface to be recycled into another functional tool type will be dependent upon both the physical attributes of the biface, that is, whether it can be physically re-shaped into the desired tool, and social/ideological factors such as whether or not this re-cycling might be restricted for religious or gender-related reasons as well as the weighting of factors such as the costs vs. benefits for meeting alternate needs, etc.

There are a number of additional factors and processes that may also need to be taken into account when considering variation in a class of chipped stone artifacts like hafted bifaces. Choices made during the manufacturing process may be constrained by and reflective of the nature of the raw material available and chosen for use. Specifically the size, shape and knapping qualities of the original raw material would have influenced how pieces could ultimately be shaped (Andrefsky 1994). The availability of only smaller pieces of raw material, for example, may result in a reduced length in the reduction sequence (Kuhn 1995). Factors such as changes or stability in the size and mobility of groups through time, their economic organizations and even ideological factors also have to be considered since these would have been interconnected with the accessibility of raw material sources and therefore the quality of the raw materials obtainable by different groups. Consideration must also be given to the degree to which tool stone resources may have become exhausted and the need and ability to adopt more intensive extractive or quarrying processes which in turn would be interconnected to the degree to which trade with other neighbouring groups could be relied upon, etc. Individual variation in the necessary manufacturing skills has also long been recognised and to this can be added different degrees of understanding of the necessary productive "constellations of knowledge" and willingness to follow social norms (i.e., agency) (Bursey 2016; Sinclair 2000). Economic, social, political and ideological factors would also have influenced whether production was specialized and reliable and perhaps under the control of a few individuals or whether the technology was designed to be maintainable and usable by everyone (Bleed 1986). All of these factors may have been inter-related and so caution must be exercised at all stages of an analysis. My discussion cannot be exhaustive, therefore, since we lack much of the necessary information from archaeological contexts to fully explore what the relevant variables might be.

Once I have described the attributes of Jack's Reef and related chipped lithic bifaces, I will review the available information on dating, context and association. There has been a long-standing trope that Jack's Reef and similarly dated types represent a technological transition between the Middle Woodland and the initial Late Woodland cultures known as Princess Point and Riviere aux Vase. Given some of the

information that has been published in recent decades, therefore, a review of this interpretation may be in order.

IDENTIFYING JACK'S REEF AND RELATED STYLES

Having spent many years discussing and debating projectile point identifications with colleagues both in the field and back in the "lab," I have no doubt about the difficulties of identifying similarly shaped projectile point types dating to very different chronological horizons. While this problem will probably remain with isolated points recovered as isolated finds or from mixed and potentially multicomponent contexts, I believe that paying closer attention to the manufacturing sequence and techniques (i.e., the lithic reduction system) used to make these points and the types of repair to correct damage from use may mitigate some problems. Manufacturing sequences in particular have been of use in identifying patterns of production that can be associated with broad cultural patterns and even specific culture-historical groupings.

There have been a number of "field guides" and taxonomic reviews of bifaces and projectile points published for the lower Great Lakes region over the years and these can serve as a starting point for discussing both broad regional similarities and local variations. William Ritchie's (1971) typology for New York State was, of course, the first such guide and most of those that followed added to what Ritchie had written. A small number of attributes considered diagnostic of Jack's Reef and related bifaces have been referred to at different times and these will be considered in detail.

Attributes considered diagnostic of Jack's Reef include the use of relatively flat, thin flakes that were directly manufactured by pressure flaking into a pentagonal preform that is sometimes considered a separate point type known as Jack's Reef Pentagonal. Corner notches were then flaked into the lateral edges below the shoulders. Commonly the blade is described as triangular although to at least some extent this blade shape may be a product of resharpening. Notched Jack's Reef bifaces were commonly recycled into other tool types, particularly drills.

The production of projectile points from flake preforms is generally recognised as being one of two poles in a dichotomy used to describe lithic reduction systems. In the most simplistic terms, serial biface reduction involves taking an objective piece such as a block of chert and shaping it into a tool by detaching flakes from two surfaces with variable attention paid to the potential use of the detached pieces or flakes. In actuality many serial biface reduction systems do make use of large flakes, whether detached from a core or directly from bedrock (e.g., Ozbun 1991) but the key is that the production of flakes for tools is not a main goal of the reduction system.

Large stemmed Genesee broad points may serve as an example of biface reduction in that, presumably, relatively large blocks or flakes of Onondaga chert were bifacially flaked until they were shaped into haftable projectile points. While the reduction sequence for bifaces is relatively well known (Kenyon 1981) the paucity of published examples of living sites makes it unclear just what role flake tools might have played in this system. A similar argument can be made for standardized Meadowood bifaces which also appear to have been used as preforms for a wide variety of tool types and with little information available for the use of other tool types (Ellis et al. 1988; Granger 1978).

Robert Kelly (1988) published a now classic model of Paleoindian bifacial lithic reduction where chert blocks were first flaked to produce rough or crude bifaces but with the intent being to produce flakes that could be used as flake tools. Rough bifaces could also be used as relatively heavy-duty butchering tools and the resulting dulling of the edges might have served as edge preparation for subsequent flake detachment. Eventually, as these chopper/cleavers were re-sharpened, and flakes detached for use as other

tools, the object piece would have been transformed into a preform for a knife or projectile point. Detailed studies of the lithic reduction of Ontario Paleoindians have been published by Brian Deller and Chris Ellis (see 2011 for a synthesis and comprehensive references) and demonstrate that the fluted point lithic reduction strategies in this region were both more complicated and opportunistic than this but Kelly's model remains a useful heuristic.

In contrast, flake-based lithic reduction systems involve shaping the objective piece (i.e., core) with the intent of controlling how flakes are detached from that core so that it is the flake that can then be shaped to become a tool. Once suitable flakes can no longer be detached, the core might be used as a tool but may often be simply discarded to be recovered archaeologically as one of any number of exhausted core types. Perhaps the ultimate in flake-based lithic reduction systems is found in western Europe during the Upper Paleolithic where highly uniform blades were struck from cores and these flakes were retouched to produce virtually all tools manufactured from stone. Somewhat comparable blade and blade-core reduction systems are present in North America at different times (Collins 1999; Kuzmin *et al* 2007) but usually in conjunction with serial biface reduction trajectories.

In practise it is unlikely that either end of this dichotomy can serve as anything more than a heuristic devise as it is unlikely that either extreme would have actually been practised. We don't know, for example, to what extent Genesee point makers might have used the broad flat flakes detached from the large preforms and projectile points but this is a product of excavation, analysis and reporting. It seems unlikely that the sharp edges of flakes or cores would ever have been entirely ignored. Similarly, even the largest bifaces may be initiated from the reduction of very large flakes, including "bifacial" flakes detached at quarry sites (Ozbun 1991).

The production of hafted bifaces directly from flakes is now known to have a considerable antiquity in the Northeast. At least some bifaces were directly manufactured from flakes during Paleoindian times (e.g., Deller and Ellis 2011:71). Similarly some Kirk Corner-notched projectile points were directly manufactured from suitable flakes (Wilson et al. 1997) although serial biface reduction appears to have been preferred but followed a different trajectory than seen at earlier times (Bursey 2008, 2012). Kurt Carr (1998) has observed that a significant percentage of later-dating bifurcate-base points were also directly manufactured from flakes (see also Lennox 1993) suggesting the adoption of a more opportunistic lithic reduction strategy perhaps in conjunction with the adoption of a wider variety of raw materials including some of poorer quality. These flake-based reduction systems are most commonly identified by remnant surfaces of the original flake in the middle of one or both faces that had not been obliterated by flake detachments.

While similar detailed lithic analyses have not as yet been undertaken for later time periods, I suspect that there is a considerable shift to a much more biface-based reduction system during the Middle Archaic. Brewerton projectile points, in particular, appear to have been extensively re-used and recycled. Furthermore, although seemingly isolated finds are relatively common and sometimes found in "clusters," occupations other than manufacturing sites appear to be rare and I suspect this is because the lithic use strategy put little emphasis on the detachment of flakes rendering the occupations below what is considered to be archaeological visible to many or most. In contrast, at least some Late Archaic reduction strategies appear to oscillate back to the adoption of more opportunistic lithic reduction systems, including the use of low quality raw materials, producing relatively dense artefact scatters and therefore a greater likelihood of being excavated.

Early Woodland Meadowood bifaces were mentioned above as an example of a highly formalized biface-based strategy but we know relatively little about the earlier or contemporaneous Adena communities beyond burial contexts. In the Niagara Peninsula, however, Adena bifaces are relatively common surface finds but are usually made from lower quality cherts and are not as finely flaked. This raises some

interesting questions about the relationship between Adena and Meadowood users, assuming they are not one and the same and whether there might have been separate populations involved perhaps extending back through to earlier Archaic times. Middle Woodland populations are also not well known outside of burial contexts but appear to see a trend from the use of high grade cherts that were finely flaked to more poorly flaked bifaces manufactured from lower grade cherts later in time.

Late Woodland lithic reduction systems do appear to be very much flake-based, particularly in comparison to the Middle Woodland (Shen 2001). My own examinations of the lithics from later Late Woodland assemblages such as the Uren substage Anderson site (Bursey 1996) and the Middleport site did find that serial biface reduction is present but that direct manufacture from flakes dominates. Probably the most detailed and analogous analysis of projectile point manufacture can be found in the projectile point manufacturing system from Grasshopper Pueblo (Whittaker 1987, 1994).

I think a key point here is that the manufacture of Jack's Reef projectile points by what was most likely pressure-flaking flakes was the preferred method numerous times throughout the prehistory of southern Ontario but can be contrasted with serial biface reduction so long as a false dichotomy can be avoided. Specifically, my own experience with the lithic assemblages from numerous Middle Woodland sites around the Hamilton and Grand River area and east to Kingston leads me to believe that the Middle Woodland can be characterized by serial biface reduction with notched bifaces being relatively thick and often poorly flaked, particularly on later-dating sites like the HH site (MTO 1996). In contrast, Jack's Reef projectile points retain clear evidence of having been directly manufactured from flakes as noted by Ritchie (1971) and others. This evidence consists of remnants of the ventral surface of the original flake and remnants of the curvature of the original bulb of percussion even if that is preserved only as a sinuous curvature of one face when the biface is seen in profile. This attribute is more like what is found on later-dating Late Woodland sites rather than what is seen in the Middle Woodland.

Pentagonal shaped bifaces, another diagnostic attribute of Jack's Reef bifaces, are also an attribute of multiple technological traditions. Perhaps most notably, the long-lasting Susquehanna Tradition which spans the Late Archaic Genesee broad point users through Perkiomen to Orient Fish Tail points includes the production of a pentagonal preform by serial biface reduction with the lower margins reserved for various forms of hafting ranging from stems to notches. It is also worth noting that both Justice (1987:219) and Lantz (1989:13, 15, 17) indicate that pentagonal preforms may also characterize Raccoon Notched and possibly Port Maitland projectile points which appear to be contemporaneous with Jack's Reef bifaces. In these cases, as with the Jack's Reef Pentagonal "type," pentagonal preforms may have been a discrete stage in the production and use of bifaces in that the pentagonal preforms may have been cached or stored for a variable period of time before being further modified for use. An analogous situation may be cited with the Meadowood cache blades where bifaces were created and stored and later reworked into a variety of tool types (Ellis et al. 1988; Granger 1978).

I suspect, however, that a pentagonal shape serves more than one purpose. For example, the lower margins are certainly a convenient area for the addition of a hafting element with the cutting blade edges projecting beyond the haft. A pentagonal shape, then, would simply be one expected alternative in the production of a relatively broad-bladed form of biface with a clearly defined area for hafting.

A pentagonal shape is also a common stage within some Late Woodland projectile point production sequences such as those recovered from the early Uren Anderson site and the Middleport site. In the Middleport assemblage a pentagonal shape was produced during serial biface reduction when a relatively thick, vertically oriented (i.e., when the biface was laid flat) tabular face was retained relatively late in the production sequence, after the tip had been largely formed. This tabular surface served as the striking platform for the detachment of relatively flat thinning flakes that would allow a considerable amount of force to be directed into the preform detaching a greater amount of mass with less danger of the platform

collapsing although with an increased danger of hinge and/or step terminations. This danger of hinge or step terminations appears to have been mitigated by bifacially sharpening the opposite edge shortening the length of the thinning flakes that had to be detached from the middle of the biface.

A pentagonal shape is also observable on a large number of bifaces from the Anderson site, particularly projectile points broken during manufacture. In this case, a pentagonal shape appears to have been produced by directing pressure flake detachment from the tip obliquely towards the base. Directing flake detachment in this way, rather than directly across the width of the biface, may have served to increase the mass removed through flaking with a somewhat, but clearly not entirely, reduced risk of breaking the biface. As a consequence some bifaces discarded during manufacture, whether broken or not, were somewhat pentagonal in shape. Depending upon degree of refinement, these may also appear to have been finished.

Finally, a pentagonal shape may also emerge during the resharpening and/or repair of hafted bifacial projectile points or knives while they were in use or in the haft. Basally directed flakes detached from the lateral edges of the blade can result in the creation of a shoulder when the hafting area remains unmodified. I raise these examples in order to illustrate that a pentagonal shape may have functional significance beyond any "stylistic" preference or the deliberate manufacture of a pentagonal shape for the placement of a hafting element. While certainly Jack's Reef and the related Raccoon Notched bifaces appear to have been deliberately manufactured from a pentagonal preform, at least superficially preforms and hafted bifaces from other technological horizons may bear some resemblance due to a kind of equifinality in production and rejuvenation techniques.

Jack's Reef points are not noted for being overly large. Choice of raw material would have an effect on projectile point size and is sometimes considered to be a distinctive, although perhaps not totally diagnostic, attribute of the horizon depending upon the geographic area under consideration. Exotic materials like Ramah chert or quartzite, jaspers and rhyolite, for example, are found on some Atlantic coast sites (Goodby 2013; Lowery 2013). In contrast, in southern Ontario relatively high quality Onondaga was preferred. Although this preference for Onondaga chert is an attribute of numerous technological traditions and horizons it does appear to contrast with the increased use of local, poorer quality cherts seen in some late Middle Woodland sites. For example, at the HH site in Stoney Creek, which produced radiocarbon dates from between AD 400 to 650 (calibrated), a third of the chipped lithics including five of the 16 Chesser Notched projectile points, was locally obtained Ancaster chert (MTO 1996). While perhaps a product of reporting, I am not aware of any examples of Jack's Reef manufactured from lower quality materials such as Ancaster or Haldimand chert. Given that much larger projectile point styles such as Genesee points were manufactured from the same raw material (i.e., Onondaga chert), pure raw material constraints cannot be cited as the reason Jack's Reef points are much smaller. It is worth noting, however, that one gargantuan example of a Jack's Reef pentagonal biface has been reported from the Atlantic coast (Lowery 2013: Figures 8A, 12, 13) but this is a rarity, to say the least. Hypothetically it might be possible to cite exhaustion or social-political factors such as warfare blocking access to specific outcrops or quarries but since a small size is noted over a relatively large geographic area, the small size would appear to reflect constraints imposed by intended use.

The use of notches to aid in hafting the biface to a shaft of handle also, of course, has considerable antiquity although the specific type of hafting element (i.e., corner vs. side notches, stems, etc.) fluctuates considerably and frequently through time. There have been debates about the possible correlation of the appearance of notches on Late Paleoindian or Early Archaic bifaces with the introduction of new weapons delivery systems with some pro (e.g., Wright 1995) and some against (e.g., Ellis 2004). Similar arguments have been made for the appearance of Jack's Reef Corner-notched bifaces and so this topic will be returned to below.

Before moving on, however, some consideration should be given to Raccoon Notched projectile points. These points have rarely been reported in the literature of southern Ontario and have not been described in detail although I have seen some examples in association with pottery dating to roughly the same time span argued for Jack's Reef. Both Justice (1987:219) and Lantz (1989:13, 15, 17) describe Raccoon Notched points as having been manufactured from pentagonal preforms and from manufacturing techniques similar to those used to make Jack's Reef.

With regard to variation in the shape of notches, perhaps one of the more instructive examples would be what is seen in Middle Archaic Brewerton points. Brewerton bifaces appear to have been manufactured by way of serial biface reduction. The larger, more pristine and broad-bladed examples, however, are of the corner-notched variety. As the blade edges were resharpened, however, the corner notches were transformed to side notches and ultimately into the Brewerton Eared variety. This sequence of morphological changes through lateral resharpening may be analogous to what is seen in Jack's Reef Corner-notched bifaces in that lateral resharpening of the edges may have transformed the Jack's Reef type into the Raccoon (side) Notched variety by removing the barb at the shoulder. If this should prove to be the case then the difference between Jack's Reef and Raccoon Notched sites may not reflect any kind of social, ethnic or chronological difference but rather the average length of time between when supplies of suitable stone raw materials were replenished and bifaces replaced.

Port Maitland points appear to be far more rare but may represent a similar phenomenon. On the basis of the few I have seen from surface collections, these may be simply early Levanna points with weak side notches. If so then a key underlying dimension to explaining projectile point variability at this time may be in explaining the addition of notches to the hafting technology at the time. While this would not fully explain the appearance of Jack's Reef and Raccoon Notched point forms with their use of pentagonal preforms, it helps account for one hypothesis, to be explored below. For now it should be obvious that what will be needed are assemblages from secure, well-dated contexts that can be analysed to determine the lithic reduction sequence. This contextual data will also assist with the identification of bifaces from surface collections with typological assignment made on the basis of appeals to authority with consequent errors in judgement that would arise from similarities with bifaces that may well date to entirely different technological horizons.

In sum, many of the individual attributes of the Jack's Reef and related projectile point types may be found in other technological systems and this has led to confusion in identification particularly given the amount of variation that can result from damage during use, resharpening or variation due to the different skill levels of past flint knappers. Accordingly we should expect that some of these attributes will be observed in bifaces from other times and also that not all these attributes will be present in all bifaces in a Jack's Reef assemblage. While these kinds of variation may afford us opportunities to learn from larger assemblages, they will hamper identification of isolated finds or small assemblages, particularly when sampling strategies are less robust than we might prefer. In turn, this identification problem will hamper our ability to explore variation and continuity in space and time as well as our understanding of the various cultural dynamics.

CULTURE-HISTORICAL PLACEMENT OF JACK'S REEF

While it might appear that the culture-historical placement of Jack's Reef bifaces has been reasonably well established (e.g., Ritchie 1980), I would argue that some of the more recent research and dating of the introduction of domesticated plants (i.e., corn) and the transition from the Middle to Late Woodland in southern Ontario offers some relevant insights.

The timing and nature of the transition from the Middle to Late Woodland in southern Ontario has long been of interest in the region for a number of reasons (Martin 2008) but it is sufficient to note that debate exists concerning whether there was an in situ evolution from the Middle to Late Woodland or a migration and at least partial population replacement. Although not central to the debate, some advocates of the autochthonous position hold that Jack's Reef bifaces represent a transitional technology between the thicker notched bifaces of the Middle Woodland and the thinner, un-notched triangular bifaces of the Late Woodland. A key to this argument would be the chronological placement of Jack's Reef bifaces relative to the timing of the transition.

The initiation of the Late Woodland in southern Ontario is determined by the appearance of corded pottery, decorated with cord-wrapped stick designs, and the introduction of domesticated corn and has been directly dated to A.D. 500 or slightly before (Crawford and Smith 1996; Crawford et al 1997). While descriptions of the material culture have not been published in detail since Stothers (1977), the association of this early corn with Princess Point pottery has not been in question and there does not appear to be any indication of Jack's Reef projectile points in association the earliest pottery and corn. Thus, the transition from Middle to Late Woodland, however it is inferred to have happened, appears to have been, or at least begun, before A.D. 500. In the Niagara Peninsula region of southern Ontario, specifically around the west end of Lake Ontario, however, remnant Middle Woodland material culture in association with thicker side-notched projectile points, appears to have remained in use after this time until A.D. 600 or later (MTO 1996).

It is worth noting that Middle Woodland material culture in more extreme southwestern Ontario may also survive significantly later than A.D. 500. The most southwestern of the Middle Woodland complexes is Couture. Spence, Pihl and Murphy (1990:144-145) argue that earliest Middle Woodland assemblages, dating to ca. 200 B.C., are characterized by Snyders points until A.D. 1 when they were replaced by Vanport points manufactured primarily from Flint Ridge chert or chalcedony from Ohio. Unfortunately, the vast majority of Couture complex sites are multi-component with small Middle Woodland assemblages and/or are multi-component with Late Woodland occupations present (Spence et al. 1990:146-147). The only radiocarbon date for the Couture complex is one from a pit at the primarily Late Woodland Robson Road site (Spence et al. 1990:146), which Smith (1997:42) notes is relatively late, with a recalibrated modal value of A.D. 660 and a 2-sigma range from 430-940 A.D. Consequently, if the pit contents do in fact date a Middle Woodland occupation then this occupation would be later than the oldest cornparable dates for southern Ontario and after the inception of the Transitional Woodland Princess Point. Other Middle Woodland dates from southwestern Ontario come from the uppermost of two components at the Bluewater Bridge South site near Sarnia, Ontario (O'Neal 2002). This component may represent some period of time but it has a high percentage of cord-wrapped stick ceramics (25% of exterior rim decoration on a small sample of vessels (N=8) but with mainly side-notched "Saugeen" points (N=10). Yet, a single Jack's Reef point was also recovered. The two dates from this component calibrate at a 2-sigma range to AD 220-460 and AD 320-660 (O'Neal 2002: Table 3.2). This evidence suggests cord-wrapped stick ceramics may occur earlier at that site, just as they do at sites to the west in Michigan (see O'Neal 2002:103) and that the transition to Jack's Reef points also may have occurred relatively early or only as late as ca. 660 AD – but only assuming, perhaps wrongly, that the two dates are representative of the age range of that extensive upper component.

The Saugeen complex occupied the region further to the east, approximately between the Nottawasaga and Grand Rivers (Spence et al. 1990:148). The only projectile point type noted for the complex is Saugeen (Spence et al. 1990:148) except for Port Maitland at the Pond Mills site (Spence et al. 1990:156) which has an even later radiocarbon date (Smith 1997:45) and cord-wrapped stick decorated pottery. Smith (1997:45) concludes from several post A.D. 500 dates that Middle Woodland in general throughout southern Ontario may extend to as late as A.D. 800 or later but many of these dates come from multi-component sites and contextual information is sparse or lacking, raising the possibility of contamination

from other, later, occupations. In fact, the association of corded and cord-wrapped stick pottery raises the question of whether these components can be called pure Middle Woodland or whether an additional (?) Transitional or early Late Woodland occupation was present. Unfortunately, therefore, very few assemblages from southern Ontario can be identified as being reasonably discrete, single-component and well dated. The reported assemblages with Jack's Reef, Raccoon Notched and similar point types are most often surface collections that may not have been further excavated, multi-component and/or undated or with the dates dubiously associated with the projectile points.

The only site in the published literature with reasonably secure dating and with the largest assemblage of projectile points of interest here is the 11H8 site from Point Pelee. Keenleyside (1978:73) notes two occupations at this location, the earlier producing a date recalibrated to late in the 7th century (Smith 1997:48-49). Keenleyside (1978:73-74) attributes this occupation to post A.D. 800 "Time Period 2" but possibly coeval with the end of "Time Period 1". Of note, the early Point Pelee sequence is dominated by pottery with cord-wrapped stick decoration but Time Period 1 includes some evidence of coiling and dentate stamping, attributes commonly attributed to the Middle Woodland (Keenleyside 1978:70-71, 80). Dentate stamping occurs rarely at 11H8 but appears to be present at both occupations (Keenleyside 1978:79, 80). For both "Time Period 1" and the early component at 11H8 specifically, the projectile points are un-notched triangulars with concave bases (Keenleyside 1978:72, 76).

The second occupation identified at 11H8 produced a suite of three radiocarbon dates (Keenleyside 1978:63) recalibrated to late in the 8th or late in the 9th century A.D. or relatively late in the Riviere au Vase of the Transitional Woodland (Smith 1997:48-49). It is to this relatively late occupation, i.e., most likely 9th century A.D., that side- and corner-notched projectile points are attributed (Keenleyside 1978:76).

Jack's Reef has also been reported for the Van Bemmel site (Murphy and Ferris 1990:203) while Port Maitland side-notched points are reported for the Simons, Cherry Lane and Robson Road sites (Murphy and Ferris 1990:203). All, except Simons, have produced radiocarbon dates shortly before or after A.D. 1000 (Smith 1997:49, 52). Further east, the Buttar site near Rice Lake produced a Jack's Reef Point recovered from a feature with a radiocarbon date of A.D. 930 +/- 110 (uncorrected) (Jackson 1987:5).

Other Jack's Reef, Raccoon Notched and Port Maitland points are known, of course. A survey of the Provincial database produced records of several isolated finds but none of these included any mention of having been excavated, let alone radiocarbon determinations. Others described in the literature (see, for example, Bursey 1995; Fox 1990) have been found in association with artifacts like pottery that can include both Middle and Late Woodland attributes but, particularly in light of the lack of absolute dating and understanding of the cultural dynamics of the time, may be interpreted as either evidence of an evolutionary transition of contact and trait diffusion between different populations.

In sum, while there are very few examples of securely dated Jack's Reef Corner-notched, Raccoon Notched or Port Maitland points in the literature, those that exist appear to be dated to the second half of the first millennium A.D. and, in fact, closer to A.D. 1000, not A.D. 500 when the transition from Middle to Late Woodland is posited to have occurred. Contexts where earlier dates have been obtained appear to be cases of multicomponent occupations and the earlier dates are not in direct association with the projectile points of interest here.

The appearance of Jack's Reef, Raccoon Notched and Port Maitland bifaces in southwestern Ontario, then, may be 300 to 500 years after the transition from Middle to Late Woodland. This inference is actually in line with neighbouring regions with some indication that Jack's Reef and related styles appear earlier along the Atlantic coast (Lowery 2013:24; Goodby 2013:64) than further to the west (Evans and Fortier 2013; Halsey and Brashler 2013:150-151; Lantz 1989:47-50; McConaughy 2013:41-43; Redmond

2013:120) with intermediate regions (Gates St-Pierre 2013:78, 81; Rieth 2013:93-94), appropriately, intermediate in age. Depending on the criteria used to define the Middle and Late Woodland and the transitions between them in each region, Jack's Reef appears to date to either the transition or a century or two later. It is uncertain, therefore, that whatever insights the appearance of the Jack's Reef technology has to offer, it is ambiguous as to whether it is related to this process.

DISCUSSION

In Bruce Trigger's synthesis of the history of archaeological thought, he argued that by 1960 "(i)t also was widely accepted that culture-historical archaeologists had substantially accomplished their goal of creating a prehistoric cultural chronology for the United States and it was now time to begin explaining the archaeological record" (Trigger 1996:394). While it can be argued that this is largely correct, there are still additions and revisions being made to local and regional culture chronologies as new assemblages are reported and dated or knowledge of local culture-histories refined. Simply, the culture-histories of some areas of North America are not as well-known as they are for others - some have received greater attention due to factors such as proximity to universities with research agendas, government mandates to recover archaeological remains prior to loss from land development and the willingness within different local archaeological communities to publish the results of field investigations and research. Additionally, greater attention has been focused on some archaeological complexes or horizons than others with particular attention being given to those featuring either large, rich and relatively spectacular archaeological remains, those lending themselves to particular problems such as "first peopling" or the origins of complex societies and those associated, in one way or another, with colonialism (although these are not necessarily mutually exclusive concepts).

The culture-history of North America is also being constantly refined and/or remodeled as different interpretations of the processes invoked to explain changes in the archaeological record are tested and accepted, abandoned or revised. Consequently, there have been, and continue to be, many and varied attempts to revise, replace or even remove the long-held taxonomies used to organize the past (e.g., Williamson and Watts 1999), often accompanied by arguments that the older culture classifications impede the growth of knowledge and understanding (Hart 2005). Commonly, it is argued that the nature or language of the classification moulds or sculpts our understanding of the past by concealing some kinds of variation while over-emphasizing others. Ultimately these arguments appear to be premised on assumptions that the culture-historical classification system itself determines how the past is seen and interpreted.

While I am not necessarily convinced that these kinds of appeal to a soft linguistic determinism need necessarily hold true, I would agree that either too rigid or too loose an adherence to archaeological classification systems or interpretive paradigms can influence how we come to view the past. The place of Jack's Reef Corner-notched projectile points may serve as an example of this problem in that it has long been assumed that these bifaces represent a transitional technology between the Middle and Late Woodland complexes of southern Ontario and beyond, presumably or primarily because they were notched in contrast to some later triangular bifaces that were not. In large part, this assumption appears to have persisted simply because of the paucity or imprecision of the information on the culture-history of the first millennium A.D. Although a dedicated research project has pushed the approximate date of the transition from the Middle to Late Woodland back in southern Ontario to A.D. 500 or earlier, based on dates run on corn kernels found in association with Princess Point pottery, very little detail is known of the processes that occurred during the centuries immediately before or after A.D. 500. Employing a perspective from outside southern Ontario, however, allows us to reevaluate the Jack's Reef projectile point horizon independently of at least some of the local developments directly related to the adoption of corn horticulture.

In fact, based on the evidence presented in Halsey (2013), it appears that the Jack's Reef style of biface first appears on the Atlantic coast around A.D. 500 and spreads west over as much as the next two centuries. Whatever the local tropes for identifying and explaining the transition from Middle to Late Woodland or other archaeological taxon and however historically documented ethnic groups are argued to have come about, it is clear that the Jack's Reef horizon appears in the culture history of multiple linguistic and ethnic groups. While there may have been a considerable number of commonalities between different Middle Woodland groups prior to A.D. 500 and the appearance of the Jack's Reef technology, there would certainly have been an increased amount of variation after this time given the amount of diversity among post A.D. 500 groups from the Atlantic coast to the Mississippi River valley. The appearance of the Jack's Reef technology and cluster of bifaces types also appears to vary in age relative to this transition. Thus the appearance of this technology may well be contemporaneous with the transition from Middle to Late Woodland in some areas but not necessarily in all. In southwestern Ontario, for example, available dates appear to place Jack's Reef and related projectile point styles a century or two after the appearance of corn and Princess Point and similar pottery styles and this projectile point cluster of styles persists until relatively late in the first millennium A.D., possibly even in direct association with unnotched triangular styles (i.e., the Levanna type).

Where Middle Woodland bifaces appear to be relatively thick and crudely-flaked, manufactured by serial biface reduction from whatever cherts were locally available, post-A.D. 500 point styles in the same regions appear to have been manufactured more, if not exclusively, from relatively high quality Onondaga chert whether obtained from primary outcrops or large cobbles from secondary deposits. Furthermore, while we lack detailed knowledge from pre-A.D. 600 assemblages, it also certainly appears that projectile point tips were manufactured by pressure flaking thin and suitably shaped flakes. One consequence of this change in the type of objective piece used would be a thinner and lighter hafted biface that would be sharper and easier to retouch but with greater fragility and less durability. There would also be a greater degree of specialization since these thinner hafted bifaces could not have been used as cores for detaching sharp flakes that could be used for other tasks. Although it is certainly well known that even small hafted bifaces such as arrow heads were sometimes used as knives, it is likely that these would have been used more sparingly in this way compared to a thicker, more robust tool. Additionally, and as can be seen from the Jack's Reef bifaces recovered, while manufacture from thinner flakes might have required a relatively higher quality of raw material featuring a more homogenous mass thereby allowing the detachment of larger but thinner flakes, this kind of reduction strategy would also allow a higher ratio of sharp edge per kilogram of rock since less potential sharp edge would be trapped and ultimately lost within the central mass of the biface.

Clearly there are a number of dimensions that could be tested and used to explain the appearance of the Jack's Reef style of biface. Caution is necessary, however, in distinguishing between those variables that could be invoked as being causal from those that might have become effects or consequences of a technological change. For example, citing localized constraints in the availability of suitable, high quality raw material would ignore the consequent need to support this explanation over the broad area where this kind of transition in manufacturing technology has been reported.

One hypothesis I find intriguing, however, remains with the invocation of an adoption of the bow as the projectile launching system. This argument was made by multiple authors throughout the AENA volume (Halsey 2013). Unfortunately, however, with the possible exception of a stylized bow and arrow impressed on a pot from Michigan (Halsey and Brashler 2013:157), all these arguments are based on a comparison of measures of inter-notch widths, hafting section thicknesses, projectile point weight, etc., sometimes compared to collected ethnographic analogues of arrow vs. atlatl dart tips but without any independent support. Consequently, using these measures potentially results in the identification of bows at variable times throughout the prehistoric record of North America, almost invariably followed by horizons when thicker, more robust, and therefore heavier, hafted bifaces were employed. Thus, one

possibility is that that the bow and arrow system might have been something that appeared and disappeared from the archaeological record a number of times for reasons we cannot yet explain but was ultimately adopted during the second half of the first millennium A.D. for reasons we also cannot yet fully explain. From this we have no way of knowing, as yet, whether the adoption of a flake-based technology producing small, thin projectile points was a consequence of the adoption of the bow and arrow weapon delivery system or a fortuitous "pre-adaptation".

Citing the appearance of notching as being correlated with the need for a change in hafting for use as arrowheads also raises the problem of explaining the disappearance of notches slightly later in time. This is compounded by a return to notching in the late Uren to early Middleport substages before notches again disappear before the bow is actually documented in the ethnohistoric literature. Given that I would suspect that a large number of ethnohistoric cases exist for the tipping of arrows with un-notched projectile points, I think it is tenuous at best to assert that a specialized hafting mechanism such as notches or stems necessarily reflects the adoption of a different weapon delivery system. While these cautions may not appear to offer us much, I would argue that they may at least allow us to clarify the hypotheses we can generate and perhaps test.

Returning to the culture history of this region, one possibility is that earliest post Middle Woodland peoples were using relatively large, un-notched triangular bifaces that have been subsumed under the Levanna type. Bifaces of this kind, at least some of which appear to be relatively thick and manufactured opportunistically but including serial biface reduction, do appear in the appropriate contexts including during within the A.D. 500 assemblages at Point Pelee (Keenleyside 1978). If the bow was subsequently adopted as the weapon delivery system of choice, perhaps as early as A.D. 600, a demand for a lighter projectile tip may have been met through the increased use of a flake-based reduction system requiring more massive and high quality Onondaga chert. High quality Onondaga chert outcrops along the north shore of Lake Erie and near the Grand River. In these areas, early dates have been obtained on corn and it has been argued that corn cultivation by post Middle Woodland peoples led to them being at least somewhat tethered to the flood plains and lake margins. Thus, it is possible that technological change in the weapons delivery system contributed to social isolation from those peoples who were not cultivating corn, assuming the latter also did not adopt the bow and arrow, which appears unlikely since even late-dating Middle Woodland assemblages such as that from the HH site, does not feature a change or transition in lithic technology. Should this interpretation appear to be supported then we could propose that further west along the north shore of Lake Erie closer to the Grand River, where higher quality Onondaga chert could be obtained from secondary deposits of cobbles may have experienced a similar process in that concentrations of these cobbles may have been more common in stream beds, etc., although clearly we do not have much data on the distribution of secondary deposits.

However these hypotheses are ultimately born out, it is clear at this point that too little information is currently available for the entire first millennium A.D. The Middle Woodland during the first half of this millennium is largely seen in terms of a decline in burial ceremonialism and withdrawal from participation in broad regional interaction. A rapid transition in virtually all aspects of technology, settlement patterns and subsistence is envisioned around or before A.D. 500 spurred by the adoption of corn horticulture and possibly related to either an adoption of some dialect of the Iroquoian language family or an immigration of Iroquoian speaking people. Following this episode of rapid and seemingly all pervasive change, the second half of the millennium is seen as another five centuries of stability as populations along the north shore of Lakes Ontario and Erie slowly adapted to the introduction of corn horticulture prior to moving out of riverine floodplains and settling in larger nucleated villages. At this point we simply have an abundance of hypotheses and models derived from external sources but too little archaeological data to either test or refine the many speculative reconstructions offered.

Examining the appearance of Jack's Reef and related projectile point styles from a broader perspective does provide a perspective beyond what is available from southern Ontario alone. Specifically, on the basis of the clinal trend in dates of first appearance of the adoption of this technological system for east to west, a post Middle Woodland to Late Woodland transition, by at least a century, appears to be indicated. Thus the appearance of Jack's Reef bifaces does not appear to be causally connected but may still be related to an effect of this transition. If this revision to the culture-history should be borne out by subsequent archaeological discoveries then it may also be possible to use these hafted bifaces as a type of index fossil to date assemblages and occupations post A.D. 500. Even documentation of projectile points recovered as isolated finds may then be used to explore changes in land use and thus potentially changes in subsistence systems, particularly if we can gain an improved recognition of distinctions between earlier and later un-notched triangular styles. Certainly the processes attached to the adoption of horticulture were complex and varied among different groups throughout eastern North America with some groups opting out of this change in subsistence, some adopting increasingly complex sociopolitical and economic systems and still others oscillating through various experiments with complexity and returns to essentially egalitarian formations but with varying changes in demographics, social organization, etc. Exploring dynamics stemming from changes in lithic technology can only be of value in our reconstructions.

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Unfinished Nubbin-Eyed Birdstone from the Grand Bend Area. Photo by Chris Ellis.