

THE SATCHELL COMPLEX IN ONTARIO: A PERSPECTIVE FROM THE AUSABLE VALLEY

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ABSTRACT

The Satchell complex is characterized by the presence of lanceolate and straight stemmed bifaces (blades may range from narrow to broad) that are made of greywacke, a coarse grained rock. In Ontario, stemmed greywacke bifaces are almost invariably associated with chert points of similar forms. The Ontario distribution of Satchell is confined to the extreme southwestern portion of the province; the complex is also found in adjacent areas of the United States. In this paper the greywacke bifaces are considered to be Late Archaic with a temporal placement sometime in the second millennium B.C. Satchell may be a local expression of the widely spread Broadpoint horizon. In particular, comparisons can be made between Satchell and such "Broadpoint" complexes as the Batten Kill phase of New York, Stalling's Island of the American Southeast, and the Titterington phase of Illinois and Missouri. For the Ontario Satchell, the size of the straight stemmed points is conjectured to change through time: the broad-bladed forms, which may be patterned after the broadpoints of the Southeastern United States, may be earlier than the narrow-bladed forms. The lanceolate bifaces have a more restricted spatial distribution than the stemmed points; the lanceolates appear to be most common in the American Midwest and the south-central Great Lakes. Many of the Ontario greywacke lanceolates have a distinctive use-wear pattern on their tips suggesting they may not be projectile points but some other tool type.

INTRODUCTION

The Satchell Complex in Michigan: A Summary

In the United States, the Satchell complex is found mainly in the Saginaw valley (Peske 1963), southeastern Michigan (Brose 1976; Cufur 1973) and northwestern Ohio (Cufur 1973). This complex is characterized by the extensive use of argillite (greywacke) to produce large points of several different types. These forms include straight stemmed points with narrow to broad blades, lanceolates and, infrequently, side notched bifaces. The lanceolate and various stemmed forms tend to co-occur on the same sites (Peske 1963; Cufur 1973; Brose 1976), thus providing strong presumptive evidence that they are roughly coeval.

There are different opinions concerning the age of the Satchell complex in Michigan and adjacent counties of Ohio. Since most of the Satchell artifacts are from surface sites, chronology is based mainly on comparisons with radiocarbon dated complexes elsewhere in North America. Many investigators see similarities between Satchell points and such Plano point types as Scottsbluff, Eden and Hell Gap (Peske 1963; Fitting 1970); consequently, they assign the Satchell complex to a late Paleo-Indian/Early Archaic temporal position with suggested dates of 7000-4000 B.C. (Peske 1963), circa 4000 B.C. (Griffin 1964:229) and circa 5000 B.C. (Griffin 1964:252).

Roosa in his analysis of the Warner School site disagrees with this assessment and suggests that "...the Michigan Satchell Complex, *if taken as a unit* [Roosa's italics], is Late Archaic" (Roosa 1966:33). Roosa sees similarities between the Warner School "argillite" points and certain Late Archaic point types of the mid-Atlantic seaboard. A radiocarbon date of 1060±100 B.C. (Simons 1972) from the Pinegrove Cemetery site in the Saginaw valley seemingly supports a Late Archaic placement for a least part of the Satchell complex, although Simons notes that the feature which produced this date was partly disturbed by a Late Woodland pit.

Brose (1976) attempts to reconcile these different theories about Satchell's age by proposing that it was a long-lived tradition which developed out of a Paleo-Indian base and persisted until near the end of the Archaic period. Brose's evidence for the Satchell complex's longevity is slender and rests chiefly on the distribution of surface finds and beach line chronology. On the River Raisin at the western end of Lake Erie, there is a cluster of Satchell sites on fossil beaches with elevations of 600 to 605 feet. Brose believes that the sites were probably occupied just after the end of the high water levels (approx. 605 feet) of Early Lake Algonquin; he dates this subsidence and the sites to 7500-7000 B.C. Brose's dating of these fossil beach lines is questionable since his age estimates are quite at odds with the chronology provided by Hough (1963) and Lewis (1969). Hough dates the end of Early Lake Algonquin to about 9500 B.C.; Lewis (1969) dates the beginning of Early Lake Erie (with a water level 40 meters below that of today) to 10,600 B.C. The high water levels of the Lake Erie basin predate not only the Satchell complex but probably fluted points as well. Brose's long chronology is followed in a recent popular summary of Michigan projectile point types. (Fitting, Claggett and Treichler n.d.). In this pamphlet Satchell is assigned a time span extending from 8500 B.C. to just after 2000 B.C.

Satchell As A Cultural Taxon

These questions of age aside, Satchell as a cultural taxon has been given varying denotations. Some (e.g. Roosa 1966) evidently restrict it to components containing the lanceolate and stemmed greywacke points; others use it as a generic term for all Michigan area Plano cultures (e.g. Fitting 1970). To Fitting (1970) the term "Satchell" embraces not only the "argillite" industries of southeastern Michigan but also the early quartzite-using culture of the Georgian Bay area as represented at the George Lake and Sheguiandah sites. Yet others apparently wish to avoid forcing all argillite into a Satchell taxon – however that may be placed in time – and prefer to speak of "argillite industries." In a study of the Chippewa Nature Centre site (Midland Co., Michigan), Ozker (1976: 11-13) assigns the argillite artifacts at that site to the Late Archaic but also leaves open the possibility that this material was used by later cultures.

For the purpose of the present paper, the term Satchell complex will be used for components containing the distinctive stemmed and lanceolate greywacke bifaces, but it is extended to include directly associated chert implements (it will be shown later that chert and greywacke points from Ausable sites are virtually identical except for certain attributes influenced by the differing mechanical properties of the two lithic classes). Not all greywacke artifacts from southwestern Ontario can be assigned to Satchell. Fox (1978) reports that ground greywacke celts occur in the Late Woodland period; as well, crudely flaked chopper-like tools of greywacke appear on Middle Woodland sites. What is distinctive of Satchell is not the use of greywacke itself but the use of formalized greywacke bifaces. In the present paper Satchell is considered to be a Late Archaic manifestation of limited time depth and geographical extent. Even if this restricted temporal and spatial placement is correct, "Satchell" may not be particularly valid as a taxonomic designation for a phase or archaeological culture (in Childe's sense). Elsewhere I (Kenyon 1979a) have suggested that in Ontario the production of greywacke bifaces is confined to areas where supplies of large, flaw-free cherts were so scarce that the prehistoric knappers relied on local, secondary sources of coarse grained rock. Thus Satchell as a geographic unit may be the product of lithic availability rather than a culture otherwise distinct from its neighbours. As will be shown later in this study, there is little difference between the chert stemmed points found in the Late Archaic sites of the Niagara Peninsula and New York State and the greywacke points of the Ausable valley Satchell.

ARGILLITE AND GREYWACKE

In the Michigan literature, Satchell points are usually said to be made of argillite (Peske 1963; Michno 1971). This lithic identification is questionable and Fox (1978) has suggested that the material called "argillite" is better designated as a variety of greywacke. Both greywacke and argillite are rocks of sedimentary origin; the distinction between the two is principally one of texture (for more about greywacke and argillite see Blatt, Middleton and Murray 1972; Williams, Turner and Gilbert 1954; American Geological Institute 1974). Argillite is essentially a hardened or indurated mudstone; that is, a rock composed of clay-sized particles which have been weakly metamorphosed. In contrast, greywacke is an indurated, impure (immature) sandstone: angular, sand-sized minerals and rock fragments (clasts) are embedded in a dark, fine grained (argillaceous) matrix. Greywacke is not a term of uniform meaning or universal acceptance among geologists; indeed it has engendered a considerable amount of debate in the petrological literature (it is, if you will, a "Satchell" or "Lalonde" of sedimentary petrology). While some geologists demand that rocks designated as greywacke have very specific mineralogical and textural characteristic (e.g. Pettijohn 1960; McBride 1963), others prefer either to abandon the word altogether or to retain it only as a general field term (e.g. Boswell 1960; Dott 1964). In the present study greywacke is used in the latter sense: the lithic identifications of greywacke artifacts are based on macroscopic properties - notably the hard, dark gritty appearance of the rock. The greywacke used in southwestern Ontario has a very dark grey colour although the surfaces of many archaeological specimens are weathered to a light grey. A thin section of one specimen (from the Desjardins site in the Ausable valley) shows a weathered rind which is 1 mm thick. In greywacke some of the larger clasts are visible to the unaided eye: there are usually blocky white fragments often several millimeters in size (many of these are feldspar); there are numerous pinhead-sized particles which can be seen sparkling against a cross light (many of these are quartz); sometimes there are even rounded pebble inclusions (e.g. Fig. 10).

More precise lithic identifications are possible but these would necessitate damaging the artifacts by thin sectioning; non-destructive examination techniques do not provide diagnostic information in sedimentary petrology. Thin sections have been done on two archaeological specimens from the Desjardins site (a flake and a biface fragment) and both have been identified as greywacke by personnel from the Ontario Geological Survey. From thin sections it is possible to obtain quantitative information about the ratio of clasts to matrix, the size distribution of the clasts and the proportion of various rock and mineral constituents. All of these characteristics may be used in classifying sedimentary rocks, but even with quantitative data problems arise since there are a number of different sandstone classifications presently in use (see Blatt, Middleton and Murray 1972 for a summary and bibliography). What all of these classifications have in common is that they are based on quantitative information derived from thin sections; that is, they are multivariate rather than typological (the term "greywacke" does not even have a place in some of these classification schemes). The "greywacke" discussed in the present paper should not be regarded as an absolute and final lithic identification, but rather as a somewhat loose and provisional term used instead of a more precise petrological determination.

While much of the coarse grained lithic material on Ontario Satchell sites is greywacke, other rocks are found. Slate, which is banded, fine grained metamorphic rock related to argillite, is used occasionally for biface manufacturing. Another material that occurs is siltstone: this is a silicified rock composed of silt-sized particles (a texture intermediate between clay and sand). In accordance with the usage of a previous paper (Kenyon 1979a), the term "metasediment" will be used as a generic designation for greywacke, slate, siltstone and related rocks.

Both in Ontario and Michigan the Satchell people obtained their greywacke from local, glacially derived deposits: tills, beaches and gravel bars. The primary source of this rock lies far to the north although the specific origin has yet to be identified. The suggestion (Fox 1978) that greywacke comes from the Silurian Georgian Bay formation, which outcrops on the south shore of the bay, now appears to be in error. No greywacke was observed in a recent field examination of this formation's extensive exposure along East Meaford Creek (Fox: personal communication). Michno (1971) proposes that the rock is of Precambrian origin and he points to the north shore area of Georgian Bay as a possible source. It would require a very detailed and extensive petrological study in order to identify more exactly the greywacke's ultimate source, such a study has never been done but it is doubtful whether it would tell us very much more about Satchell since, in any case, these people gathered their greywacke from glacial deposits. From an archaeological viewpoint, models of glacial transportation (e.g. Michno 1971) seem of far greater significance for understanding the availability of greywacke to the Satchell people.

THE DISTRIBUTION OF SACHELL IN ONTARIO

In Ontario, Satchell bifaces are found only in a few counties in the extreme southwestern part of the province (Fig. 1). There are only two known locales that have yielded relatively abundant Satchell material. One of these site clusters is in the lower Ausable valley just north of the Wyoming moraine. Three Ausable sites that are discussed in this paper are Davidson (Kenyon 1978a; 1979b), Sadler (Kenyon 1979a) and Desjardins (Bertulli and Wolfe 1973; Kenyon 1979a). The other cluster is near the town of Komoka on the Thames River (Lee 1951; Chillingworth 1965; Wolfe and Lennox 1974). The Komoka sites include Wishing Well, South Winds, Brodie and Blackburn. In both areas sites may be found on the flood plains as well as on high river terraces. On the low-lying, clay plains in the vicinity of Lake St. Clair and the Detroit River, Satchell artifacts are much less common than they are in the morainal belts to the northeast. In an archaeological survey of Dover Township (Kent Co.), which is on the east shore of Lake St. Clair, only one of the 52 investigated sites produced Satchell material and this was a single biface from the surface of the multicomponent Liahn I site (Kenyon 1978b).

Greywacke bifaces are not found to the east of the area shown in Fig. 1 although stemmed chert points resembling stemmed Satchell forms are common especially in the Niagara Peninsula and the Grand River valley. The chert Genesee points from the Surma site at Fort Erie (Emerson and Noble 1966) are very similar to some of the Ausable stemmed points. The junction of the Carolinian and Canadian biotic provinces (Fig. 1) corresponds very closely to the known northern limit of Satchell artifacts in Ontario. The geographic distribution of Satchell in Ontario thus appears to be environmentally determined (for a fuller discussion of this phenomena see Kenyon 1979a). The absence of greywacke bifaces in the eastern Lake Erie counties can be attributed to the abundance of high quality Onondaga chert in the Grand River valley and Niagara Peninsula areas. The northern extent of Satchell seems to be ecologically delimited.

THE CULTURE-CHRONOLOGICAL POSITION OF THE SACHELL COMPLEX

The Evidence From Southwestern Ontario

In Ontario, as in Michigan, there is little direct evidence for the dating of Satchell related artifacts. An uncorrected reading of 1830 ± 85 B.C. (I-10, 313) for the Davidson site in the Ausable cluster is the only available carbon date for southwestern Ontario (Kenyon 1978a). Davidson is also significant in that it is below the Lake Nipissing water plane (Kenyon 1978a, 1979a) and, therefore, should date to sometime after 2000 B.C. if current lake level chronologies (e.g. Lewis 1969) are accepted.

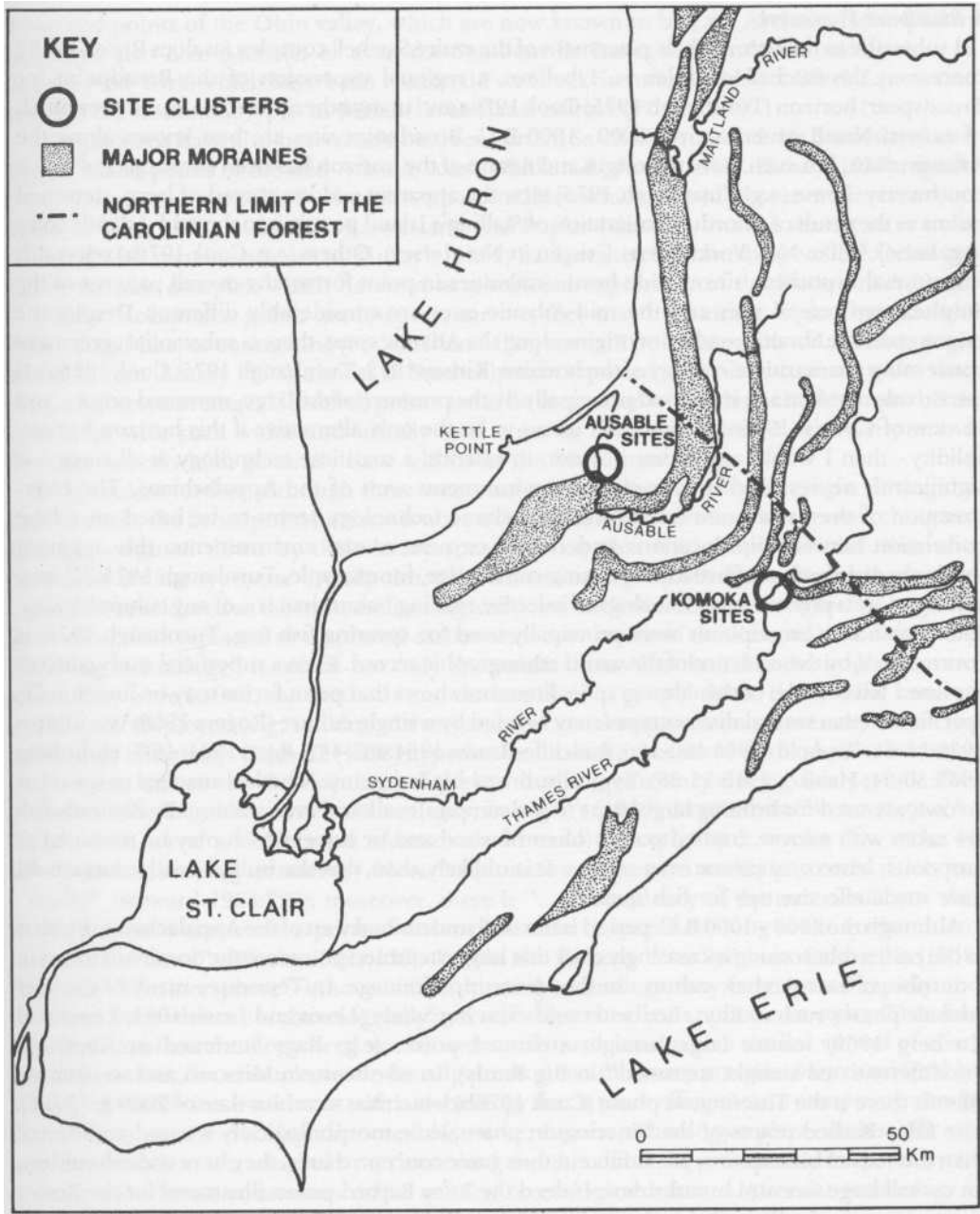


Fig. 1. Location of Satchell site clusters in southwestern Ontario. The Davidson, Sadler and Desjardins sites, which are discussed in the text, are all in the Ausable cluster. The geomorphology is derived from Chapman and Putnam (1972); the northern extent of the Carolinian zone is from Fox and Soper (1955).

A Broadpoint Framework

I subscribe to the Late Archaic placement of the entire Satchell complex (as does Roosa 1966); moreover, the Satchell complex is, I believe, a regional expression of the Broadpoint (or Broadspear) horizon (Turnbaugh 1975; Cook 1976a and many others) which is found over much of eastern North America circa 2000 - 1000 B.C. Broadpoint sites are best known along the Atlantic coast, but even there the origin and nature of the horizon has been the subject of much controversy. Some (e.g. Turnbaugh 1975) view the apparent sudden spread of large, stemmed points as the result of a northern migration of Stalling's Island people into the mid-Atlantic coast (e.g. Snook Kill in New York, Koens-Crispin in New Jersey). Others (e.g. Cook 1976a) reject this migrational hypothesis since, aside from similarities in point forms, the overall patterns of the Southeastern coastal sites and the mid-Atlantic ones are considerably different. Despite the ongoing debate about Broadpoint origins along the Atlantic coast, there is substantial agreement concerning the maritime ecology of the horizon (Kinsey 1972; Turnbaugh 1975; Cook 1976a). If the Broadpoint horizon is defined principally by the presence of the large, stemmed point – and in view of Cook's (1976a) analysis this seems to be the only alternative if this horizon has any validity – then I would argue that it is not, in essence, a maritime technology at all since it is significantly represented in non-coastal environments west of the Appalachians. The interpretation of the Broadpoint horizon as a maritime technology seems to be based on a false correlation between site locations and coastal or near coastal environments: this apparent maritime distribution of broadpoint-using culture (see, for example, Turnbaugh 1975:25) may well be more a product of archaeologists' selective reading habits than it is of any cultural reality. The notion that broadpoints were principally used for spearing fish (e.g. Turnbaugh 1975) is contradicted by the evidence of the world ethnographic record. Even a superficial study (such as the one I have made) of the ethnographic literature shows that point forms may be functionally specific and that several distinct types may be used by a single culture (Rogers 1969; Woodburn 1970:16-31; Reynolds 1968:100-106; Radcliffe-Brown 1964:435-443; Reed 1904: 46-7; Holmberg 1969:30-34; Hawkes 1916:73-88). Typically, broad-bladed points, whether attached to spears or arrows, are used for hunting large game (e.g. deer, pigs, seals and even whales). By contrast, fish are taken with narrow, barbed points (often of wood and/or bone) which may be mounted as harpoons, leisters, spears or even arrows. It is unlikely, then, that the bulky broadpoints would have made effective tips for fish spears.

Although the 2000 - 1000 B.C. period is less well understood west of the Appalachians than it is to the east, it is becoming increasingly clear that large, stemmed points are the dominant forms in a number of Late Archaic cultures in the Mississippi drainage. In Tennessee many of the later Archaic phases such as Kays, Ledbetter and even Big Sandy (Lewis and Lewis 1961; Lewis and Kneberg 1959) feature large, straight stemmed points (e.g. Kays Stemmed in Kays and "undifferentiated straight stemmed" in Big Sandy). In northeastern Missouri and westcentral Illinois there is the Titterington phase (Cook 1976b) which has a carbon date of 2000 ± 75 B.C. The Etley Barbed points of the Titterington phase while morphologically somewhat different than the coastal broadpoints are similar in their basic concept; that is, they have wide shoulders, an overall large size and broad stems. Indeed the Etley Barbed points illustrated for the Koster site are not greatly dissimilar to the Genesee points of New York (compare Ritchie 1961:77 and Cook 1976b:161 - note the ogival forms typical of many Genesees and Etleys). To this list of western Broadpoint cultures the Satchell complex should be added. Certainly the 1830 B.C. date for Ontario Satchell-like material is of the same general age as Stalling's Island, Snook Kill and Titterington.

Comparisons between Satchell and the Plano Cultures of the Plains remains unconvincing. How many times in the Eastern Woodlands have complexes once thought to have been Plano-related later been proved to be of a more recent age? One has only to think of the Steubenville

Stemmed points of the Ohio valley, which are now known to be Late Archaic; Nebo Hill in Missouri, also Late Archaic; or even the Steubenville Lanceolate and Stemmed points of eastern New York, which have been renamed Fox Creek Stemmed and Fox Creek Lanceolate and are the dominant types in Middle Woodland culture (Funk 1976).

Comparisons have also been made between certain Satchell forms and the Bare Island and Poplar Island points of the mid-Atlantic coast (Wahla n.d.; Roosa 1966). Kinsey (1977) regards these two types as part of his Piedmont Archaic tradition which in the Delaware valley is carbon dated to circa 2500 - 2000 B.C. Bare Island and Poplar Island points are similar to or even identical with certain varieties of Kinsey's (1972) Lackawaxen Stemmed type of the Delaware Valley Archaic complex which he views as a regional expression of the Piedmont Archaic. Typically Lackawaxen points are long but narrow; they may have either expanding, straight (Bare Island-like) or contracting (Poplar Island-like) stems. The mean width of Lackawaxens is about 22 mm (Kinsey 1972); almost all Satchell points reported in the literature are wider than the Lackawaxen average. If Satchell points are to be compared with Atlantic coast forms then it should be with such wider and usually later types as Savannah River, Koens-Crispin and Genesee, all of which generally have widths in the 30-45 mm range.

To speculate further, although there were undoubtedly local population shifts during the Late Archaic, the Broadpoint horizon is not easily explained by invoking hordes marching out Georgia weighted down by their heavy spears; to say that it is simply the diffusion of a particular artifact type, the broadpoint, also seems inadequate. Perhaps these broadpoints should be considered as the most archaeologically visible element in a hunting technology that for a short time replaced or displaced earlier ones over much of the Eastern Woodlands. By "hunting technology" is meant not only the points themselves but also the implements to which they were hafted, the methods and devices used to propel them, the specific hunting techniques employed (e.g. stalking, drives) and the social arrangements necessary to use the technology effectively. Caldwell (1958) hypothesized that the success of the Archaic subsistence pattern was due to the development of greater hunting efficiency during this period. This growth of efficiency—that is, cultural evolution in White's (1959) thermodynamic sense—may be the product not of a single wave of innovation but of the cumulative results of a series of revolutions in hunting technology. Now, "exploitative devices are readily borrowed if they are ...useful" (Steward 1968:329); moreover, there is "... the tendency of the trait-complexes that develop around economic aspects of the environment to spread, so long as the environment remains the same" (Wissler 1923:138). Within the Eastern Woodlands—in Caldwell's (1958) "Archaic diffusion sphere"—innovations in hunting technology may have spread rapidly and widely to form what are archaeologically identifiable as horizons or horizon-styles. The wide distribution of a technology need not be necessarily associated with a similar spread of other cultural patterns, for example, in the Broadpoint horizon mortuary practices vary considerably. A hunting revolution would start with a technology that is more efficient than competing ones in the cultural, social and ecological context of its time; the new technology replaces the less efficient one and spreads as it is adopted by an increasing number of bands; presumably its spatial limits are reached when it encounters major cultural or ecological barriers. After the technology is adopted it may be subject to disparate regional developments or adaptations which are dictated by specific local requirements or by changing cultural-ecological circumstances. A late but striking example of such an adoption-adaptational sequence is the rather sudden and widespread appearance of small thin triangular points—either notched or not notched (e.g. Madisons)—circa 500 to 1000 A.D. These points occur at about the same time over much of North America: from the Late Woodland of the Great Lakes, to the Late Period of California and even to the Valley of Mexico. Although this shift to small points presumably reflects the adoption of "modern" bow and arrow hunting, it seems to be merely the latest in a series of hunting innovations in North American prehistory.

How does this Broadpoint framework apply to Satchell? The currently available carbon dates (Stoltman 1966, 1974) strongly indicate that the broadpoint technology has its origins in the Southeast. From there it spread not only north along the Atlantic coast but also northwest to the Mississippi drainage and the southern Great Lakes. In these areas the local hunting technologies, but not necessarily the local cultures, were replaced. Carbon dates suggest that this northern extension of Broadpoint hunting technology occurred sometime between 2000 and 1700 B.C. (Turnbaugh 1975). Although the earliest points in these secondary areas may resemble the prototypical Savannah Rivers, subsequent local developments may result in rather different forms. In eastern Pennsylvania the local development is from Koens-Crispin/Lehigh Broad to Perkiomen to Susquehanna to Dry Brook to Orient (Kinsey 1972). As proposed in a later section of this paper, the adaptational sequence in the Satchell complex may be from long, broad-bladed points (Peske's Type III and the style which most resembles Savannah River) to long, narrow-bladed points (Type II) and, perhaps, ultimately to the shorter and even narrower points found at Pinegrove (Simons 1972) and Warner School (Roosa 1966).

Admittedly this Broadpoint framework for viewing the Satchell complex is highly conjectural, but surely it is no less tenable than vague considerations of Scottsbluff-Eden connections, or notions of a tradition spanning some 6500 plus years with a time range pinned down at one end by the mounting evidence of a Late Archaic placement and at the other by the tenacity of long held opinion.

THE AUSABLE ARTIFACT ASSEMBLAGES

The following comments on artifact types and industries are based on collections from the Ausable site cluster (see Kenyon 1978a, 1979a, 1979b for more information). The major sites used in this study are Davidson (surface collection and 27 square meters of excavation), Desjardins and Sadler (both surface collections). The last two cited are multicomponent but the majority of the diagnostic artifacts are large, stemmed points; the bulk of the collections from these sites is presumed to pertain to the Late Archaic complex here under discussion. A number of other Ausable sites yield similar material but often in highly mixed contexts, so the artifacts from these components are much less useful for analysis.

Lithic Industries

The Ausable sites contain a mixture of chert and metasediment artifacts. There are three major classes of raw material: Onondaga chert, Kettle Point (Port Franks) chert and metasediments. The industries based on these three lithic types are described below.

Kettle Point Chert

This chert outcrops in the vicinity of Kettle Point about 20 kilometers to the west of the Ausable site cluster. This high quality chert is the most abundant lithic material in the debitage collections from the Ausable sites. It usually constitutes 85% or more of the debitage samples. Kettle Point chert is employed in a fairly wide variety of tools unlike Onondaga chert and metasediments which have more restricted uses. At the Davidson site (Kenyon 1978a, 1979b) Kettle Point chert is used in the manufacture of projectile points (preforms are common), end scrapers, drills, block cores, retouched flakes and a single plane-like tool.

Onondaga Chert

Onondaga chert outcrops in the Niagara Peninsula area. On the Ausable sites, debitage of Onondaga chert occurs in frequencies of under 10% although projectile points of this material are more common (Kenyon 1979a). This chert type probably entered the Ausable valley in the

TABLE 1
SPATIAL DISTRIBUTION OF LITHIC RAW MATERIALS
FROM THE DAVIDSON SITE (EXCAVATED AREA ONLY)

MATERIAL*	SITE SECTOR	
	North	South
Kettle Point Chert	80.1%	96.4%
Onondaga Chert	2.6%	0.7%
Metasediments	17.3%	2.9%
SAMPLE SIZE	421	421

$X^2=54.756$, $df=2$,
significant at .001 level

*Raw materials other than the three named are excluded.

form of finished points and preforms. Onondaga debitage consists mainly of bifacial retouch flakes and other tools of this material (drills and retouched flakes) seem to be made either from point fragments or from the retouch flakes. The Desjardins site has produced an Onondaga square stemmed drill which is clearly reworked from a Genesee point.

Metasediments

Metasediments have an even more restricted range of use than Onondaga chert only bifaces, which may be either stemmed or stemless, are made from this material. Greywacke is easily found as cobbles and boulders in the glacial deposits of the Ausable area. Metasediment debitage occurs with about the same frequency as Onondaga chert (usually under 10%) although points are fairly common: at Desjardins about half the points are made from metasediments although cherts predominate in the Davidson and Sadler points. The debitage itself appears to derive mainly from biface finishing and reworking; little of it suggests the initial manufacturing stages of biface production. One infrequent but characteristic find is the cobble or boulder spall (Fig. 2). These spalls must have been produced elsewhere since the boulders and cobbles from which they have been struck do not occur on the sites. The spalls are made from the same greywacke that is used in biface manufacturing. Although some of the spalls may be tools, most of them are probably blanks for the bifaces. Typically, the dorsal face consists of the original rounded cobble cortex, but the interior or ventral face tends to be quite flat. This flat cross-section would make them ideal as biface blanks since large percussion bulbs on flake preforms are often difficult to remove. The spalls could be most efficiently produced by a throwing technique: the greywacke "core" is flaked by throwing it against a boulder; with luck, the impact will produce a suitable spall. The lack of a well defined bulb of force is a characteristic of this technique (these observations are based on my own experiences with "boulder bashing").

Intrasite Variability in Lithic Utilization

This overall pattern of lithic utilization is reflected in the intrasite spatial distribution of debitage: lithic types employed in making many different tool forms are widely spread over a site, but raw materials used for making only a limited range of implements tend to be concentrated in "hot spots."

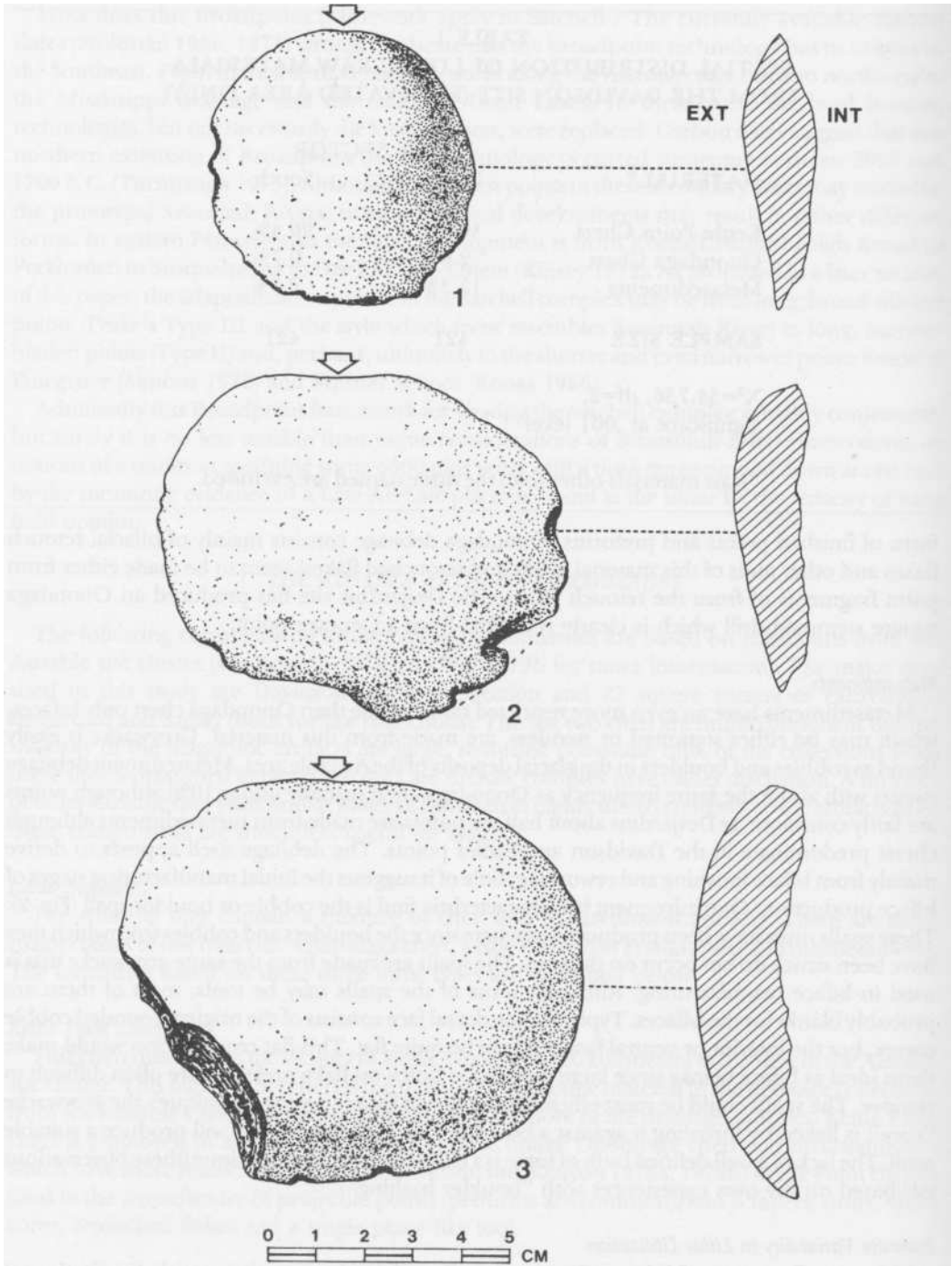


Fig. 2 Greywacke spalls. The dorsal or cortex surface is shown on the left, the cross-section is on the right. The arrows indicate the location and direction of the cone of force. Sites: 1: near Davidson; 2: Desjardins; 3: Sadler.

TABLE 2
SPATIAL DISTRIBUTION OF LITHIC RAW MATERIALS
FROM THE DESJARDINS SITE (SURFACE ONLY)

MATERIAL*	SITE SECTOR		
	East	Central	West
Kettle Point Chert	91.1%	92.4%	86.7%
Onondaga Chert	5.9%	6.8%	7.3%
Metasediments	3.0%	0.8%	6.0%
SAMPLE SIZE	169	592	369

$\chi^2=22.192$, $d f = 4$,
significant at .001 level

*Raw materials other than the three named are excluded.

In the Ausable site cluster, Kettle Point chert serves as an "all-purpose" lithic material whereas imported cherts (Onondaga) and local coarse grained rocks (metasediments) are used chiefly for bifaces. The Ausable sites are characterized by a general scatter of Kettle Point debitage, a reflection of the multifarious tasks in which this material was used. In contrast, metasediment, a special purpose lithic, has a more localized debitage distribution on sites. To a lesser extent this localization is also found in Onondaga chert. At the Davidson site, a 2-meter wide excavation along the river's edge displays a marked discrepancy in the frequencies of metasediment and Onondaga chert debitage between the northern and southern sectors of the site (Table 1). The 2.9% metasediments found in the south sector is probably typical of the site as a whole, since a surface collection made from the entire site has about 8% metasediments (Kenyon 1979b). The 17% figure for the northern sector of the excavation may indicate the location of a metasediment biface production and/or reworking area. At the Desjardins site the surface collection shows a more intensive use of metasediments in the western sector than in the central or eastern sectors (Table 2).

Biface Types

In his article on the "argillite industries" of Michigan, Peske (1963) identified four biface forms which he labelled types I through IV: Type I is a lanceolate biface; Type II is stemmed point with a narrow blade; Type III is similar to the previous type only it has a wide blade; Type IV is a side notched point. The Ausable data for each of these types are discussed below although, for reasons to be explained later, Types II and III will be treated together.

Type I (Lanceolate Bifaces)

Metasediment lanceolates are less common in Ontario than they are in Michigan. Of 39 metasediment bifaces from the Ausable sites, 8 (20.5%) are lanceolates; in Peske's (1963) Michigan sample, Type I constitutes 41.6% of the metasediment points. In the Ausable site cluster, the lanceolates (Fig. 3) seem to be made only from metasediments. There are unstemmed bifaces of chert but these all seem to be preforms; they are wider and much thicker than the stemmed points whereas the metasediment lanceolates are usually narrower (Table 3).

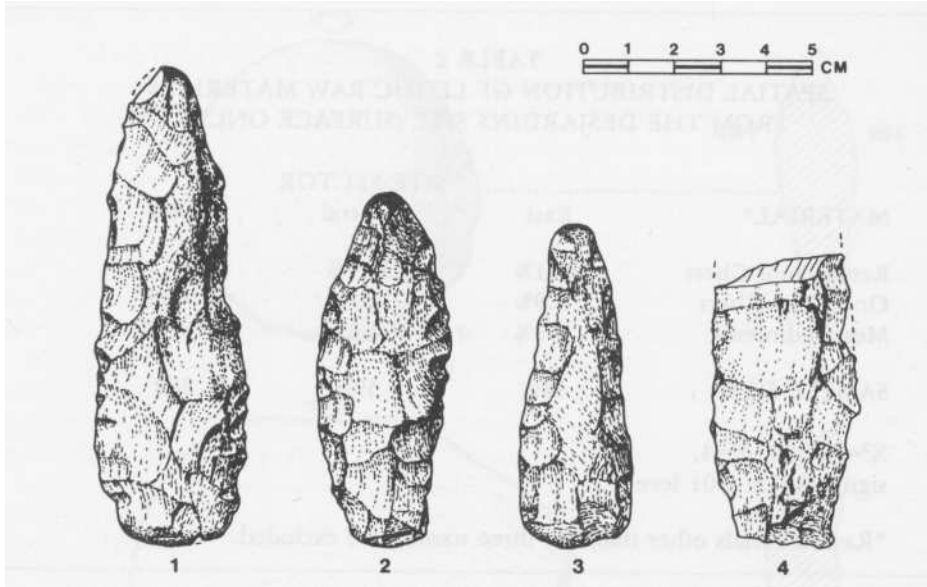


Fig. 3. Greywacke lanceolate bifaces. The three complete specimens all have worn tips. Sites: 1-3: Desjardins; 4: Davidson.

TABLE 3
SUMMARY STATISTICS FOR SACHELL BIFACE WIDTH AND THICKNESS

	SISUNG (MICHIGAN)				AUSABLE VALLEY (ONT.)			
	Stemmed		Unstemmed		Stemmed		Unstemmed	
	W	T	W	T	W	T	W	T
Mean	36.87	11.20	27.92	12.08	33.77	10.82	30.25	12.80
Standard Deviation	8.25	1.85	5.73	1.83	6.23	1.40	2.32	1.58
Correlation Coefficient	.554		.815		.052		.348	
Generalized Variance	160.83		36.96		75.60		11.73	
Sample Size	30		12		13		8	

Note: all measurements are in mm.; Sisung data from Cufr (1973)

The majority of the Ausable metasediment lanceolates display an extreme degree of smoothing-type use wear especially on their tips (a fuller analysis is in Kenyon 1979c). The tips are frequently round (Fig. 3:1-3) and the wear pattern suggests that these bifaces were vigorously rubbed against some fairly soft, yielding substance; they are not scrapers or strike-a-lights. It is not clear from the literature how many of the Michigan bifaces possess a similar use-wear pattern; Brose (1976) reports and illustrates rounded tips for some of his argillite "knives." A few of the stemmed metasediment "points" from the Desjardins site display similar tip smoothing. One of the Onondaga chert Genesee points from the Surma site near Fort Erie (Emerson and Noble 1966) also has a well rounded tip (personal observation). Witthoft (1955) notes that some of the Late Archaic points from Pennsylvania show an extreme use-wear although in his specimens the rounding is more intensive on the lateral margins than on the tips. As discussed below, tip

rounding also occurs in the Titterington phase of Missouri. Tip rounding has a wide, if somewhat sporadic, distribution in Late Archaic cultures although it is not presently known whether historical connections or functional parallels are indicated.

Table 3 is a compilation of width and thickness measurements for Sisung, a Michigan Satchell component (Cufr 1973), and the Ausable sites (the stemmed points are from the Desjardins site only). The "generalized variance" indicated in the tables requires further comment. In Tables 3 and 4 this statistic can be interpreted as a measure of the overall variability of width and thickness; low values indicate biface cross-sections with fairly uniform sizes and shapes, higher values reflect less uniformity (i.e. greater variability). More specifically, the generalized variance is the determinant of the covariance matrix derived from the width and thickness measurements (for further details see Morrison 1967). A comparison between the Michigan and Ontario data shows the same basic pattern in both areas. The unstemmed bifaces are narrower and thicker than the stemmed points. The lower generalized variance values for the unstemmed bifaces show that this artifact type has a highly standardized cross-section and that these lanceolate bifaces are made according to a fairly specific "mental template." These data demonstrate the similarities in size between the Michigan and Ontario lanceolates.

The extreme use-wear and metric pattern of the Ausable unstemmed bifaces suggests that they are not projectile points but special purpose tools designed so as to have a particular size and cross-sectional shape; however, the Michigan lanceolates are so numerous that it is difficult to believe they could all be such functionally specific implements. Since lanceolates quite often co-occur with stemmed points, Type I "points" must surely be coeval with the stemmed Type II and III forms.

TABLE 4
SUMMARY STATISTICS FOR BIFACE WIDTH AND THICKNESS IN TWO TITTERINGTON
PHASE SITES

	BOOTH (MISSOURI)				KOSTER (ILLINOIS)			
	Stemmed		Unstemmed		Stemmed		Unstemmed	
	W	T	W	T	W	T	W	T
Mean	33.52	10.74	28.63	10.76	37.17	11.66	27.00	10.93
Standard Deviation	5.43	2.10	1.98	1.20	4.13	1.60	2.00	0.76
Correlation Coefficient	.158		-.479		.076		-.792	
Generalized Variance	126.95		4.38		43.56		0.85	
Sample Size	31		9		18		3	

Data from Cook (1976b) and Klippel (1969).

The Titterington phase of Illinois and Missouri offers a striking parallel to the Satchell complex. In Titterington there are two contemporaneous point types: Etley Barbed, which is stemmed, and Sedalia, which is stemless. Width and thickness measurements for two Titterington sites are provided in Table 4. The two point types show the same basic metrical pattern found in the Satchell complex: unstemmed bifaces are narrower than the stemmed forms; the unstemmed artifacts are less variable in cross-section as measured by the generalized variance. Several of the Sedalia (Class 7) points from the Booth site in Missouri (Klippel 1969) display prominent rounding use-wear on their tips.

In summary, unstemmed bifaces are associated with stemmed bifaces in at least two Broadpoint cultures, Titterington and Satchell. The unstemmed biface may be a distinct Late Archaic tool type in the Midwest-southern Great Lakes region. Although some of these bifaces may well be projectile points, others clearly are not.

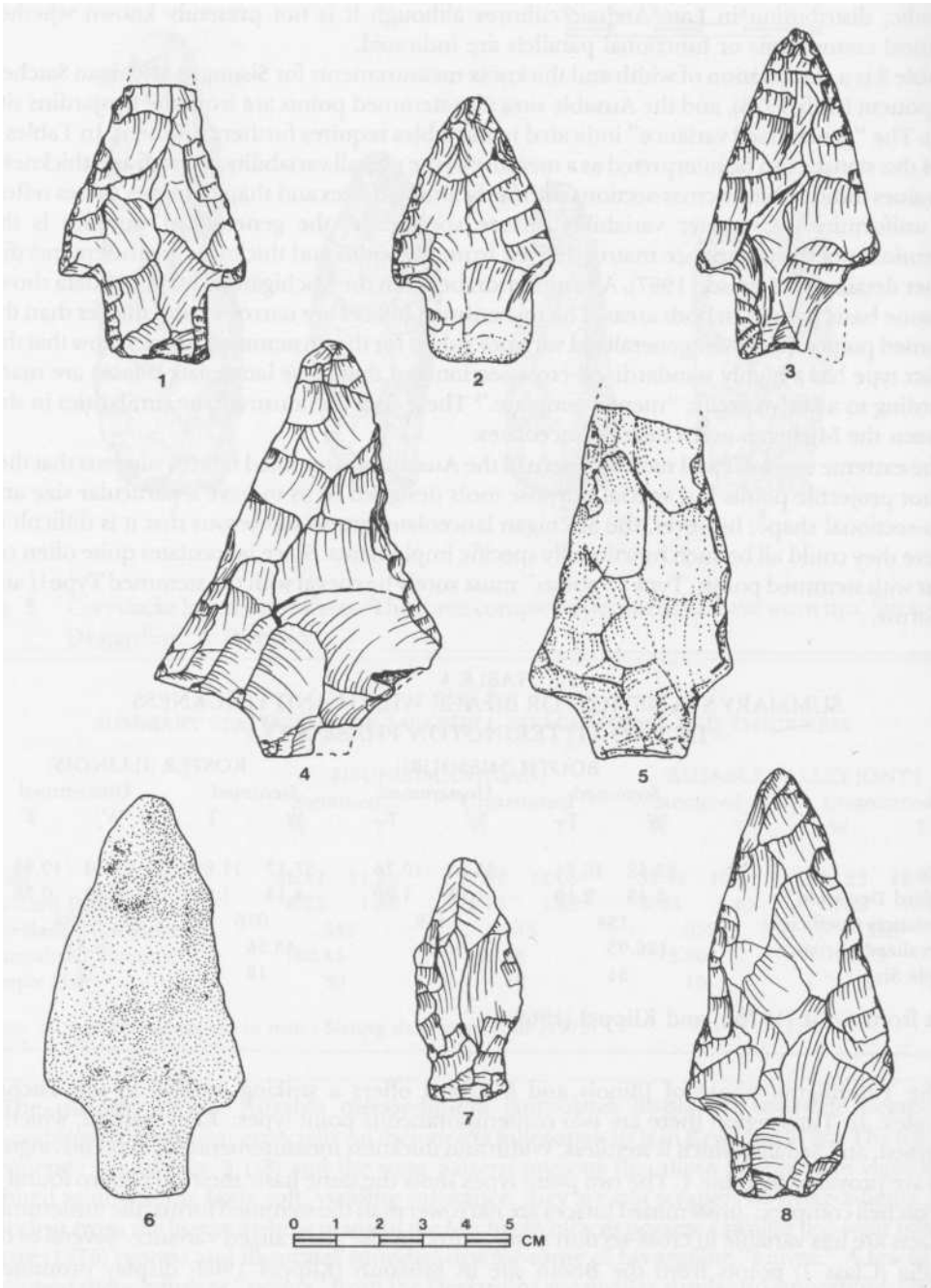


Fig. 4. Stemmed projectile points from the Davidson site. Raw materials: 1-4: Onondaga chert; 5 and 6: greywacke; 7 and 8: siltstone. Note that 4 and possibly 5 are preforms.

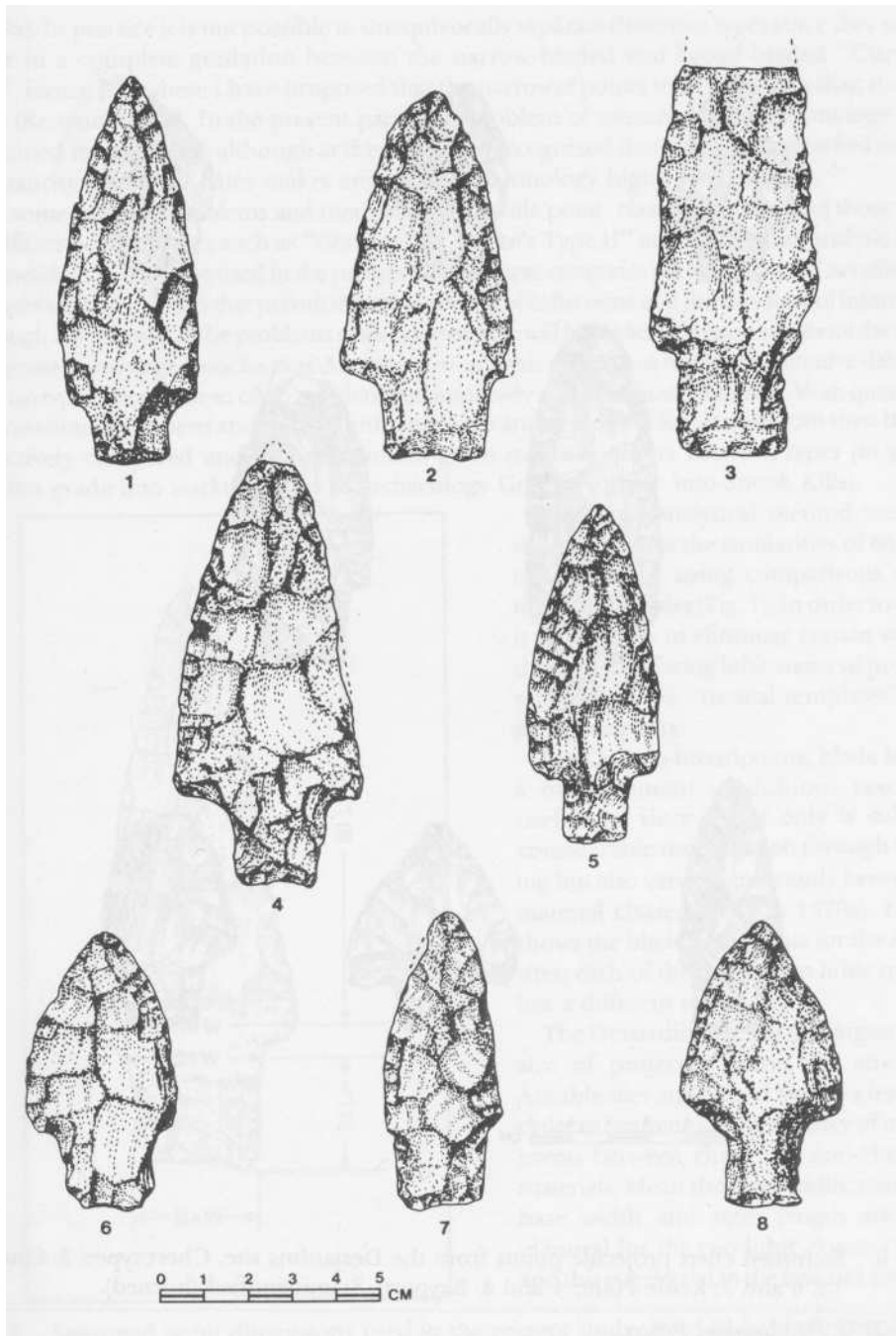


Fig. 5. Stemmed greywacke projectile points from the Desjardins site.

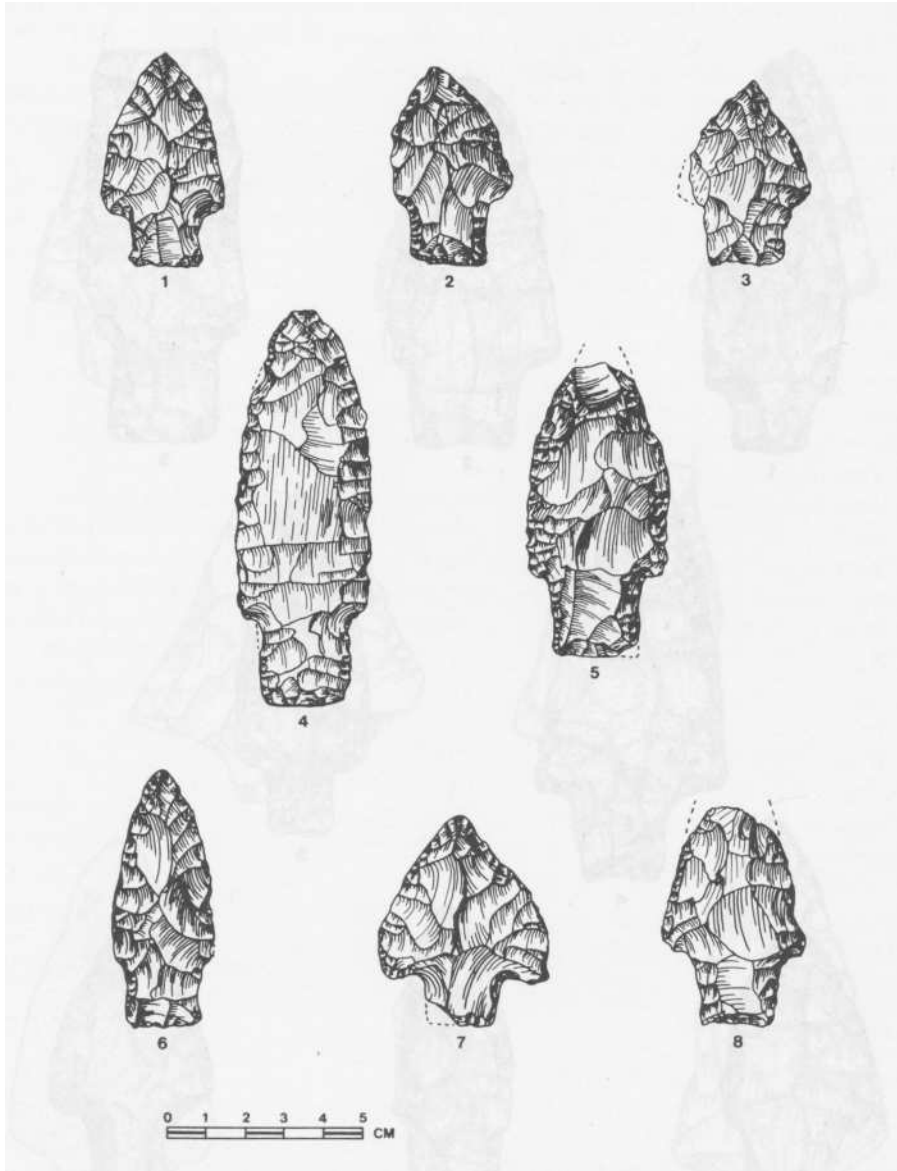


Fig. 6. Stemmed chert projectile points from the Desjardins site. Chert types: 5: Onondaga; 1,2 6 and 7: Kettle Point; 4 and 8: Bayport; 3: unidentified (burned).

Types II & III (Stemmed B faces)

Metasediment stemmed points (Fig. 4 and 5) are the most common Satchell biface found in southwestern Ontario. On the Ausable sites they are invariably associated with similar points made of chert (Fig. 4 and 6). Peske's (1963) distinction between narrow-bladed (Type II) and broad-bladed (Type III) stemmed points has great merit since Satchell sites in both Michigan and Ontario display statistically significant intersite variation with respect to shoulder width (Kenyon

(1979a). In practice it is not possible to unequivocally separate these two types since they seem to occur in a complete gradation between the narrow-bladed and broad-bladed "Christmas tree" forms. Elsewhere I have proposed that the narrower points tend to be later than the wider ones (Kenyon 1979a). In the present paper the problem of stemmed point chronology will be examined more closely, although at the outset it is recognized that the lack of stratified sites and the paucity of carbon dates makes any Satchell chronology highly speculative.

In some ways the problems and methods of projectile point classification parallel those of rock classification. Point types such as "Genesee" or "Peske's Type II" are on the same analytic level as "greywacke" (in the sense used in the present study). These categories are mainly useful as rather loose and general designations that permit the rapid sorting of collections and the easy flow of information, although here there may be problems since not everyone will have identical concepts about the essence of Genesee-ness or greywacke-ness. More precise analysis then, must rest on quantitative data rather than on types since these so often are identified intuitively and delimited arbitrarily. With quantitative information, specimens and sample units (e.g. sites and geological formations) can then be more objectively compared and due recognition given to the continua between types (in geology arenites grade into wackes just as in archaeology Genesees grade into Snook Kills).

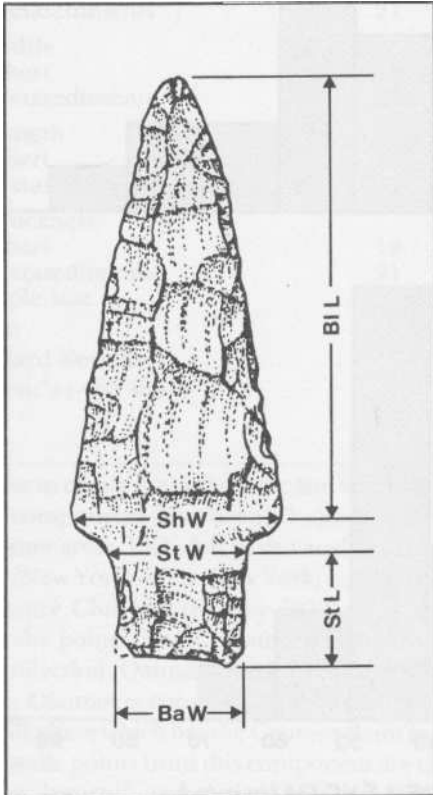


Fig. 7 Stemmed point dimensions used in the present study. Key: Bl L, blade length; St L, stem length; Sh W, shoulder width; St W, stem width; Ba W, base width. The stem thickness was measured at the St W. Note that damaged dimensions were estimated (as is the base width in this example). The point in this illustration is a greywacke specimen from the Sadler site.

The basic analytical method used here will be to assess the similarities of entire site collections by using comparisons of continuous variables (Fig. 7). In order to do this, it is necessary to eliminate certain variables that reflect differing lithic material properties rather than the "mental templates" of the stone knappers.

For Ontario broadpoints, blade length is a measurement of dubious taxonomic usefulness since it not only is subject to considerable modification through reworking but also varies significantly between raw material classes (Kenyon 1979a). Figure 8 shows the blade length data for the Ausable sites; each of the three main lithic materials has a different mode.

The Desjardins site has the largest sample size of projectile points for any of the Ausable sites and is used here as a test case in order to examine the consistency of measurements between chert and non-chert lithic materials. Mean shoulder width, stem width, base width and stem length are almost identical for the two lithic classes (Table 5) and this is reflected in the low and statistically

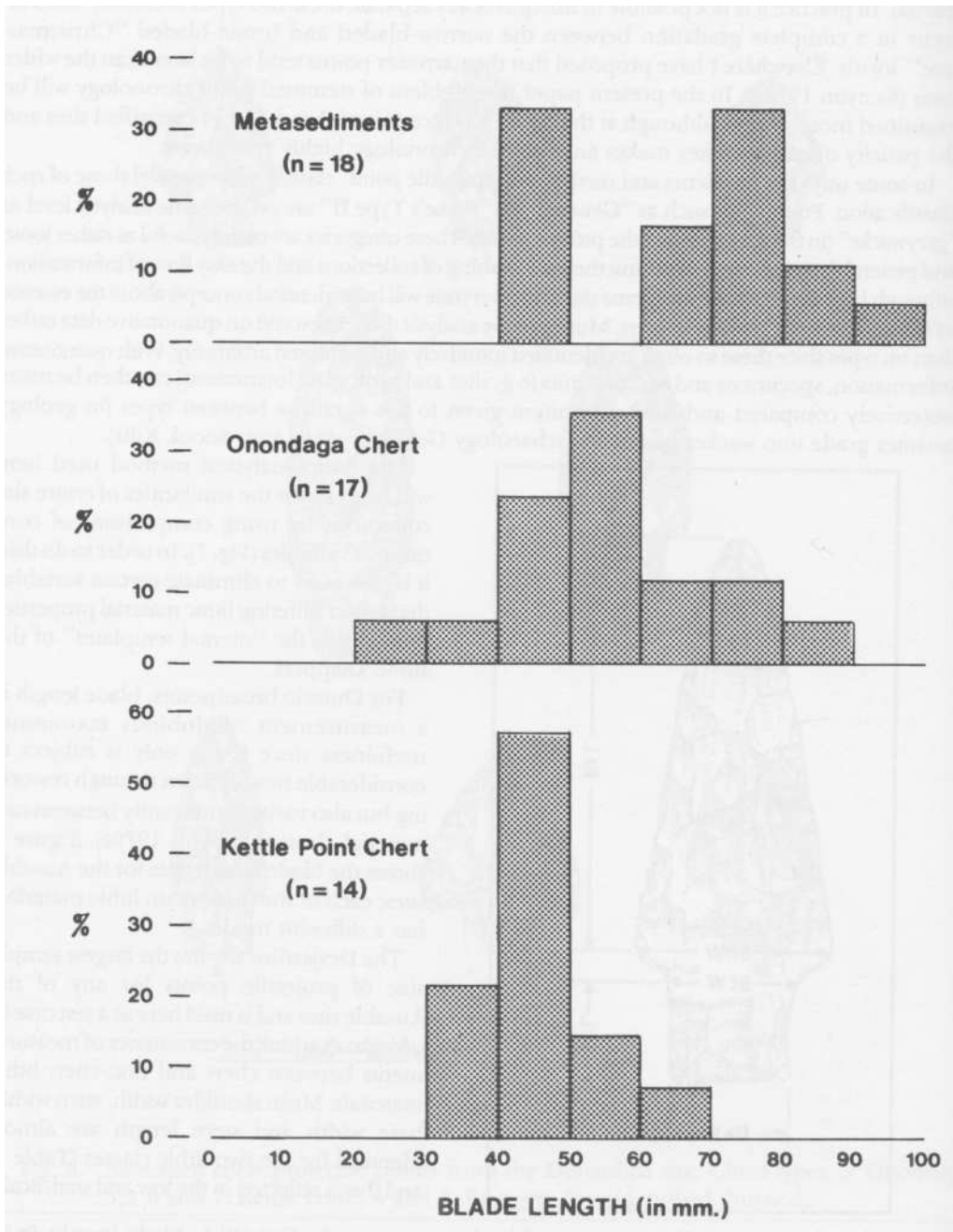


Fig. 8. Blade lengths of stemmed projectile points by raw material class. The histograms are compiled from measurements from five Ausable valley sites.

unsignificant t-tests scores. Stem thickness, however, differs quite significantly between cherts and metasediments. The greater thickness of the metasediment points is presumably due to the difficulty of thinning preforms made of granular lithics. The four attributes that pertain to the planar outline of the hafting element are, with the sample sizes used here, invariate between raw material classes and, therefore, they will be employed for intersite comparisons. Blade length and stem thickness will be excluded because these dimensions are influenced by lithic type.

TABLE 5
DESJARDINS SITE: BROADPOINT METRICS FOR CHERTS AND METASEDIMENTS

	N	X	S	T
Shoulder Width				
Chert	19	33.58	4.55	0.115ns
Metasediments	21	33.76	5.42	
Stem Width	19	21.00	2.87	0.769ns
Chert				
Metasediments	21	21.76	3.35	
Base Width	19	19.32	2.16	0.379ns
Chert				
Metasediments	21	19.62	2.82	
Stem Length	19	15.79	2.82	0.811ns
Chert				
Metasediments	21	16.67	3.88	
Stem Thickness	19	7.83	0.76	3.778***
Chert				
Metasediments	91	8.97	1.09	

N=Sample size

X=Mean

S=Standard deviation

T=Student's t-test score

ns=not significant at
.05 level

* * *significant at
.001 level

In order to clarify the taxonomic and temporal relationships of the Ontario Satchell sites, three Ausable components (Davidson, Desjardins and Sadler) will be compared with four Broadpoint sites in other areas. Included in this analysis are the Hamilton Golf and Country Club (Ontario), Oatman (New York), Weir (New York) and Doerschuk (North Carolina) sites. The Hamilton Golf and Country Club site (Howey 1977) is located near Hamilton at the western end of Lake Ontario; the points from this site are all of Onondaga chert and were sorted out from a mixed surface collection. Oatman (Funk 1976) and Weir (Ritchie 1969) are both in the upper Hudson drainage. Oatman is considered by Funk to be a pure component of his tentatively identified Batten Kill phase which has the Genesee point as its diagnostic type. Weir is a Snook Kill phase site and projectile points from this component are classed as Snook Kills. Ritchie (1961) believes that there is a "genetic" connection between Snook Kill and Savannah River. Funk wonders if "...Genesee and Snook Kill points (are) two stages in an evolutionary sequence..." (Funk 1976: 263). Doerschuk is located along the Pee Dee River in North Carolina (Coe 1964). The broadpoints at Doerschuk are typed as Savannah River which is the characteristic point form of the Stalling's Island culture. The Savannah River type is included in this analysis not only because it is a well dated type but also by reason of the fact that many archaeologists view it as the ancestral broadpoint form.

TABLE 6
SUMMARY STATISTICS FOR HAFTING ELEMENT ATTRIBUTES (in mm)

SITE	N	Shoulder Width		Stem Width		Base Width		Stem Length	
		X	S	X	S	X	S	X	S
Davidson (Ont.)	7	41.29	8.40	24.71	3.77	22.14	2.27	17.43	3.41
Sadler (Ont.)	12	37.58	5.90	23.00	2.86	21.83	2.62	18.58	3.03
Desjardins (Ont.)	40	33.68	4.96	21.40	3.11	19.48	2.50	16.25	3.40
H. Golf Club (Ont.)	12	33.17	6.09	20.45	2.38	17.75	2.49	10.92	1.98
Oatman (N.Y.)	15	31.74	5.31	21.05	3.48	19.43	3.68	13.45	1.87
Weir (N.Y.)	22	36.78	6.13	19.87	2.87	14.52	3.03	12.28	1.28
Doerschuk (N.C.)	14	43.17	4.65	23.81	3.10	20.79	2.49	15.89	3.66

N=sample size; X=mean; S=standard deviation

TABLE 7
MAHALANOBIS DISTANCE VALUES (D^2) FOR SEVEN BROADPOINT SITES

	DOER	DAV	SAD	DES	OAT	HGC	WEIR
DOERSCHUK	X	ns	**	***	***	***	***
DAVIDSON	0.85	X	ns	*	*	**	***
SADLER	3.48	1.33	X	*	**	***	***
DESJARDINS	3.29	2.01	1.20	X	**	***	***
OATMAN	4.60	3.86	4.33	1.51	X	ns	***
H. GOLF CLUB	5.11	6.45	9.01	4.52	1.47	X	***
WEIR	5.43	8.69	11.98	7.25	7.38	4.36	X

Note: D^2 values in lower left corner;
Statistical significance in upper right.

ns=not sign. at .05 level
* =sign. at .05 level
**=sign. at .01 level
***=sign. at .001 level

The summary statistics for each of the seven sites are provided in Table 6. The data for the four Ontario sites are derived from measurements made by the author. Metrics for the other three sites were obtained by measuring the specimens illustrated in the reports cited in the previous paragraph; obviously this procedure is far from ideal so the data from the three American sites must be considered as approximate and possibly subject to biases of various forms. Table 7 shows the Mahalanobis distances (D^2) between the seven sites. The D^2 value is a measure of numerical distance or dissimilarity (Rao 1952): samples with identical means will yield a distance score of 0; increasingly large D^2 values indicate increasingly greater differences. The statistical significance of the D^2 can be evaluated and this information is included in Table 7 but, considering the way in which the data have been collected, these significance tests should not be taken very seriously.

Table 7 is arranged so that sites which are the most similar according to their D^2 values are placed beside one another; as far as possible this is an ordered "Robinson" matrix with the smallest (most similar) values nearest the main diagonal. I believe that this ordered matrix represents a chronological seriation; that is, the sites at the opposite ends of the matrix are most

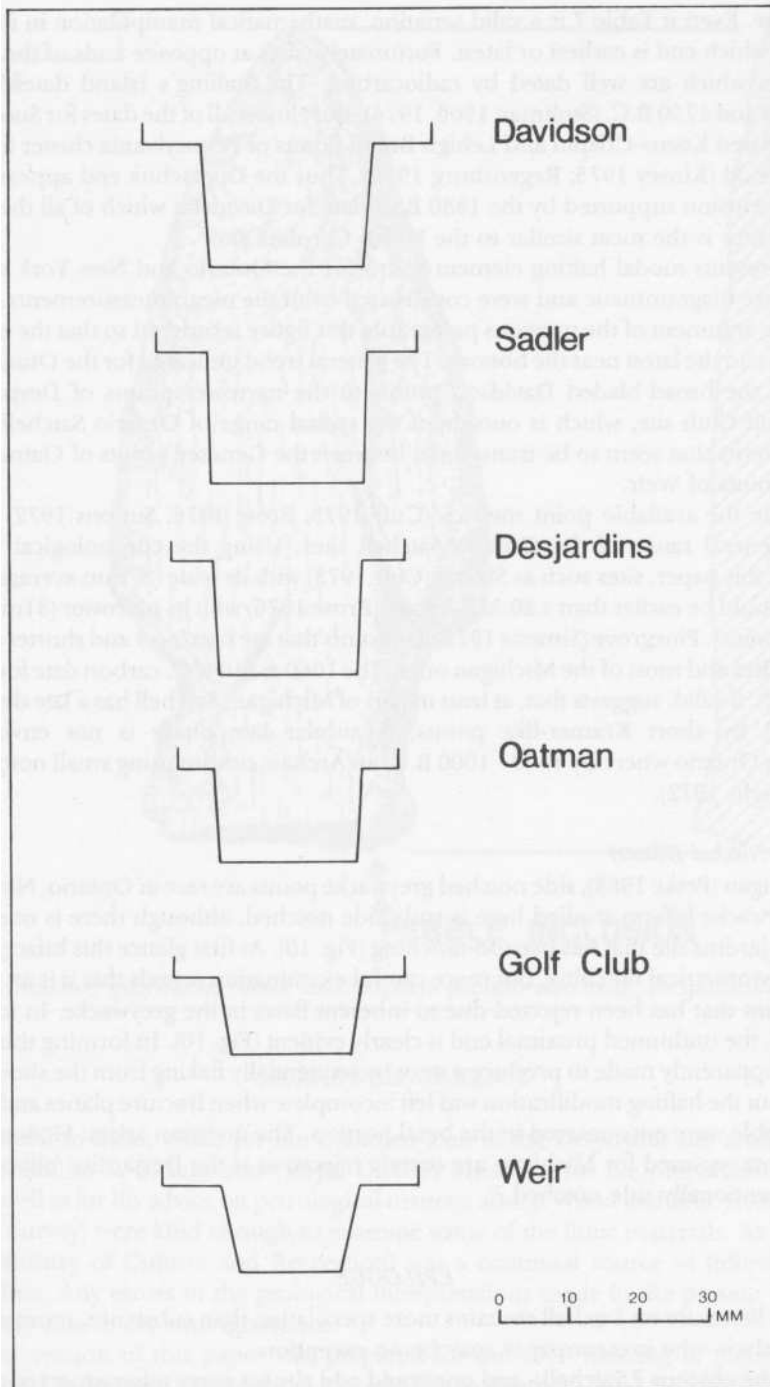


Fig. 9. Modal hafting elements forms. These diagrammatic drawings are based on the mean measurements given in Table 6. Chronological order is assumed to be from early (top) to late (bottom).

distant in time. Even if Table 7 is a valid seriation, mathematical manipulation in itself cannot demonstrate which end is earliest or latest. Fortunately, sites at opposite ends of the matrix are from cultures which are well dated by radiocarbon. The Stalling's Island dates mostly fall between 2500 and 1750 B.C. (Stoltman 1966, 1974). But almost all of the dates for Snook Kill and the closely related Koens-Crispin and Lehigh Broad points of Pennsylvania cluster in the 1720-1580 B.C. period (Kinsey 1975; Regensburg 1974). Thus the Doerschuk end appears to be the earliest, a conclusion supported by the 1830 B.C. date for Davidson which of all the New York and Ontario sites is the most similar to the North Carolina site.

Figure 9 presents modal hafting element forms for the Ontario and New York sites. These illustrations are diagrammatic and were constructed from the mean measurements of Table 6. Following the argument of the previous paragraph, this figure is ordered so that the earliest sites are at the top and the latest near the bottom. The general trend indicated for the Ontario Satchell sites is from the broad-bladed Davidson points to the narrower points of Desjardins. The Hamilton Golf Club site, which is outside of the spatial range of Ontario Satchell, has short contracting stems that seem to be transitional between the Genesee points of Oatman and the Snook Kill points of Weir.

In Michigan the available point metrics (Cufur 1973; Brose 1976; Simons 1972) mostly fall within the general range of the Ontario Satchell sites. Using the chronological framework developed in this paper, sites such as Sisung (Cufur 1973) with its wide (37mm average) Type III-like points should be earlier than a 20-MR-19 site (Brose 1976) with its narrower (31mm average) Type II-like points. Pinegrove (Simons 1972) has points that are narrower and shorter than any of the Ontario sites and most of the Michigan ones. The 1060 ± 110 B.C. carbon date for Pinegrove (Simons 1972), if valid, suggests that, at least in part of Michigan, Satchell has a late development characterized by short Kramer-like points. A similar late phase is not envisioned for southwestern Ontario where by 1500 - 1000 B.C. an Archaic culture using small notched points is found (Wright 1972).

Type IV (Side Notched Bifaces)

As in Michigan (Peske 1963), side notched greywacke points are rare in Ontario. Not one of the Ausable greywacke bifaces studied here is truly side notched, although there is one specimen from the Desjardins site that has pseudo-notching (Fig. 10). At first glance this biface appears to have weak asymmetrical notching, but more careful examination reveals that it is an unfinished stemmed point that has been rejected due to inherent flaws in the greywacke. In longitudinal cross-section, the unthinned proximal end is clearly evident (Fig. 10). In forming this artifact an attempt was apparently made to produce a stem by sequentially flaking from the shoulder down to the base, but the hafting modification was left incomplete when fracture planes and an 9 mm - diameter pebble were encountered in the basal portion. The question arises: How many of the Type IV points reported for Michigan are merely rejects, as is the Desjardins biface, and how many are intentionally side notched ?

EPILOGUE

The extant literature on Satchell contains more speculation than substance, more argumentation than analysis - the present paper may be no exception.

May I say the obvious ? Satchell - and one could add almost every other aspect of the Archaic in Ontario - is a subject that requires far more work. As new sites are found and excavated and fresh analyses made, I have no doubt that the deficiencies and errors of the present study will be corrected.

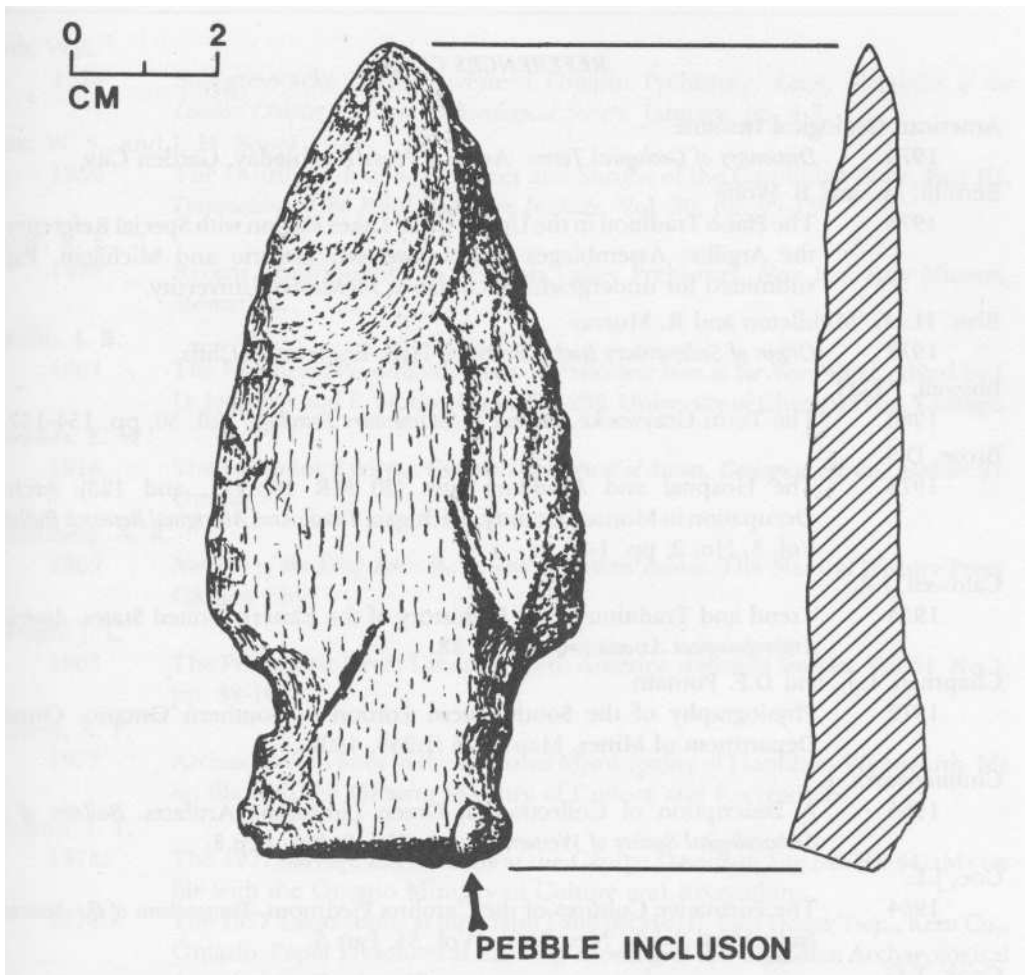


Fig. 10. Unfinished greywacke biface that displays pseudo-notching, Desjardins site.

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