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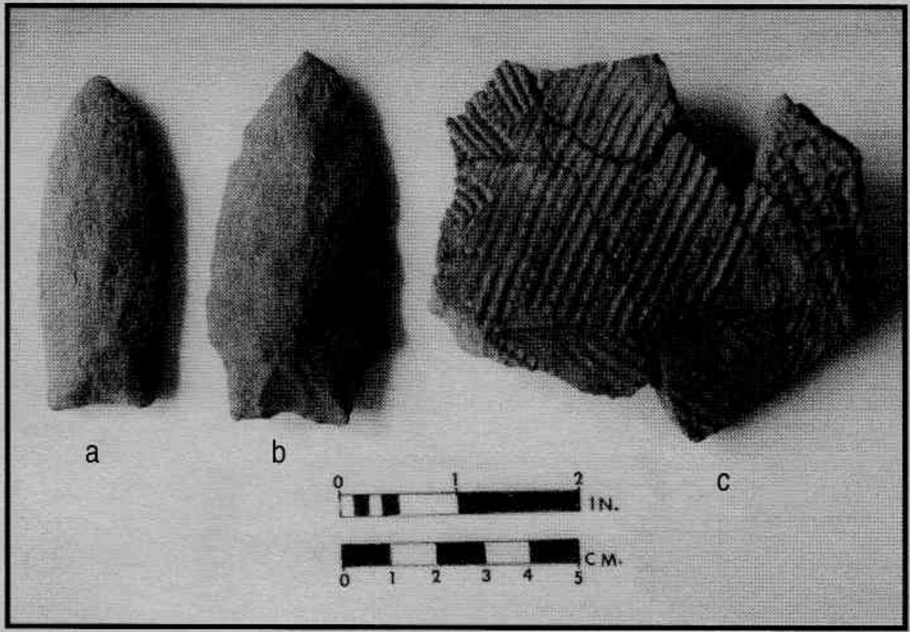

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Contents

Publications

Researches and Transactions
The Bulletin
Occasional Papers

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The Copper-Alloy Assemblage from the Seneca Iroquois Townley-Read Site, Circa 1715-1754 C.E.

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In this study, the copper-alloy assemblage from the Townley-Read Site, an eighteenth-century Seneca Iroquois site located near Geneva, New York, was examined. The assemblage is housed in two collections of which over 1000 items are located at the Rochester Museum & Science Center and 56 are located at Cornell University from the Townley-Read/New Ganechstage Project. Dimensional measurements were taken and qualitative analysis conducted on objects in both collections. This paper contains a detailed description of the assemblage, particularly British and Jesuit artifacts (including rings and medals). The study focuses on the distinction between copper-alloy materials that were recovered in their original manufactured state and copper-alloy materials that were reworked by the Seneca people. It extends the classification of the copper-alloy materials based upon their overall function in Seneca society—either for utilitarian purposes or for adornment.

The Townley-Read Site Assemblage

The Townley-Read Site is a Seneca Iroquois settlement five km southwest of Geneva, New York (Jordan 2008:95; 2002:169). Artifacts and documentary sources indicate that the site was occupied by Senecas from about 1715 until 1754 (Jordan 2008:154-162; 2002:274-91). The site was excavated by avocational archaeologist Charles F. Wray in 1979 and 1982 (Jordan 2008:110; 2002:181) and by the Townley-Read/New Ganechstage Project from 1996 until 2000, directed by Dr. Nan Rothschild and Kurt Jordan of Columbia University as a part of Jordan's doctoral dissertation research (Jordan 2008:121; 2002:166). The Townley-Read/New Ganechstage Project revealed that the Townley-Read Site was a dispersed settlement comprised of houses spaced 60 to 80 meters apart and positioned in a non-defensible area (Jordan 2008:160-161, 178; 2002:192; 2003:49). While Wray's archaeological research focused on 33 burials from the site, the Townley-Read/New Ganechstage Project looked at domestic contexts (Jordan 2008:114, 121; 2002:166, 181). The artifacts Wray and other avocational archaeologists unearthed from the Townley-Read Site are housed in the Rochester Museum & Science Center (RMSC) (unless specified, catalog numbers refer to objects in these collections). Artifacts excavated by the Townley-Read/New Ganechstage Project currently are housed at Cornell University (TR catalog numbers refer to Cornell University collections). The major published sources of information regarding the Townley-Read Site are by Jordan (2002, 2003, 2004, 2008).

Overview of Townley-Read Copper-Alloy Assemblage Study

During the fur trade, which began during the initial stages of contact between Native Americans and Europeans, Native Americans traded for copper-alloy items from the Europeans. These copper-alloy materials were extensively used and modified by Native Americans for their own purposes. This study examines the copper-alloy assemblage from the Townley-Read Site. Dimensional measurements were taken and qualitative analysis conducted on such objects as rings, bangles, kettles, beads, and pendants from both collections from the site. The research focuses on the distinction between copper-alloy materials that were recovered in their original European state and copper-alloy materials that were reworked by the Seneca people, and the artifact's overall function in Seneca society (either for utilitarian purposes or for adornment). The Townley-Read copper-alloy assemblage is of particular significance because its contents suggest continuity in the use of copper-alloy materials at Seneca sites from 1650 until 1750. The majority of the types of artifacts found at seventeenth-century Seneca sites (such as Ganondagan (Anselmi 2004:495-9) are present at Townley-Read. This indicates stability in the use of copper-alloy artifacts despite the friction occurring between Northern Iroquoian peoples and European settlers in the late seventeenth century and early eighteenth century, and as Daniel K. Richter explains, "the turn of the eighteenth century marked, from an Iroquois perspective, the climax of the ordeals provoked by the European invasion of America" (Richter 1992:191).

This study of the Townley-Read copper-alloy artifacts complements a study conducted by Lisa Marie Anselmi, which looked at artifacts from sixteenth- and seventeenth-century Wendat (Huron) and Iroquois sites made from copper and copper-alloy materials (Anselmi 2004). This study also complements Jordan's approach to the site

(Jordan 2002, 2003, 2004, 2008); his work emphasizes settlement pattern, community structure, and economy, while this study focuses on the copper-alloy artifacts themselves. Copper-alloy artifacts from the RMSC collections and the Cornell University collection have separate artifact cataloging formats. Artifacts will be referred to by their catalog numbers throughout the text. So as not to damage the artifacts, no tests were undertaken to confirm the metal type of artifacts cataloged as copper-alloy, but the identifications of the Townley-Read artifacts as copper-alloy is likely, given the established typologies of Anselmi (2004), Brain (1979, 1988), Stone (1974), Cleland (1972), and the *Charles F. Wray Series in Seneca Archaeology* (Wray et al. 1987, 1991; Sempowski and Saunders 2001).

Overview of Copper-Alloy Trade with Europeans

The use of copper did not begin with the arrival of Europeans; 7,000 years before contact, Native Americans had been working with native, or "metallic," copper (Ehrhardt 2005:56). From the Middle Archaic through the Late Woodland periods, Native Americans mainly utilized annealing and cold hammering processes (Anselmi 2004:155). Native copper tends to be found "in a readily workable state," while European copper must be smelted (Anselmi 2004:142). Since Native Americans had worked with native copper before European contact, they "recognized European copper-base metal for its color, its purity, and its excellent working properties" (Ehrhardt 2005:76-7). It is possible that as early as 1480 English cod fishermen were trading copper-alloy items with Native Americans living in Newfoundland (Anselmi 2004:1). Along the Atlantic coast, European fishermen came in contact with the Algonquian peoples and traded glass beads and copper-alloy materials for furs and pelts that the Native Americans could provide (Anselmi 2004:2). By 1580, this exchange of materials had developed into the "fur trade" (Anselmi 2004:2).

European copper was introduced to the Iroquois, and to northeastern Native Americans in general, primarily in the form of kettles (Anselmi 2004:143). In the late sixteenth century, "red copper" or "Basque-type" kettles, which were "technologically elaborate" and heavy, were traded to Native Americans living in eastern Canada (Ehrhardt 2005:72). The extensiveness of these trade relations is apparent in the fact that from just 1584 until 1587, 500 kettles were traded into the St. Lawrence region (Ehrhardt 2005:72). Although few of the kettles brought over for trade from Europe still exist in their original form, it has been found that kettles traded prior to 1600 were predominately made out of copper, while kettles traded after 1600 were mainly made out of brass (Anselmi 2004:144). This may be because brass is easier to manipulate than copper and also because copper is toxic when combined with certain foods, which meant that the kettles had to be coated in tin (Anselmi 2004:144). The chemical structure of brass gives it greater resistance to corrosion (Ehrhardt 2005:60), and the zinc present in brass makes it a better material than copper for cold working processes (Anselmi 2004:151). The copper and brass from the kettles were used by Native Americans for various purposes, and the "kettles were cut up and the metal reworked to make ornaments or utilitarian objects" (Ehrhardt 2005:74). For Native Americans, kettles frequently "were meant to serve as a raw material source rather than be used in a traditionally European manner" (Anselmi 2004:270), especially since traditional Iroquois pottery allegedly was better for cooking (Kent [1984] 2001:203).

Native American Modification of European Copper-Alloy Materials

Copper-alloy materials traded throughout the fur trade were modified by Native Americans into forms that were suited for "their own material, technological, and ideological systems" (Ehrhardt 2005:75). Anselmi (2004) lists a variety of techniques Native Americans used to rework European copper-alloy materials, including "hammering/flattening, chiseling, scoring, bending, rolling, twisting, folding, cutting using snips or scissors, sawing with a jeweler's saw, melting, perforating, and grinding" (Anselmi 2004:162).

Since hammering would result in individual pieces that could be reworked into new forms, it was the initial technique used to manipulate the copper-alloy materials (Anselmi 2004:162). Chiseling was performed on thicker metal (over 1 mm thick) for purposes of reshaping the metal into another object (Anselmi 2004:163). Scoring involved the use of a sharp object to form a line in the surface of the metal where the metal could then be broken apart (Anselmi 2004:164). Bending (considered to be "the simplest technique") involved adding physical pressure along a line in the metal until the metal broke (Anselmi 2004:165-6). Folding was similar to bending but without the break (Anselmi 2004:167). Rolling was used to make hollow shapes by maneuvering usually flat materials around a mandrel (Anselmi 2004:166), and twisting was "the literal twisting of a piece of material longitudinally" (Anselmi 2004:167). Cutting was done with scissors or some form of scissors (Anselmi 2004:168), while sawing involved the use of a jeweler's saw (Anselmi 2004:169). When materials were melted, they were heated so that the metal's edges would curve (Anselmi 2004:169). Awls were usually used to create perforations and holes in the metal (Anselmi 2004:170);

grinding (which involved moving metal over a stone) was often the final step in the modification process (Anselmi 2004:171).

The objects acquired by Native Americans through trade with Europeans were desired by Native Americans "for very different material, metaphorical, and symbolic purposes than Europeans intended at the time of their original manufacture" (Ehrhardt 2005:73). The first kettles to be traded into Native American societies did not replace native pottery, but it has been suggested that they may have been used for special communal feasts (Ehrhardt 2005:73-4). The European copper-alloy items that were modified into new objects may "have replaced, in form and/or in function, native antecedents in materials such as bone, shell, or stone" (Ehrhardt 2005:75). It is believed that Native peoples did not perceive European copper as "something 'new'; but rather they were encountering materials aesthetically similar and also 'other worldly,'" facilitating the adoption of copper-alloy items into "familiar social, ceremonial, and ideological contexts" (Ehrhardt 2005:79). The items made for adornment were "worn on the body or attached to clothing in battle or in diplomatic, funerary, and other ceremonial or festive contexts" (Ehrhardt 2005:75).

James W. Bradley explains in his *Evolution of the Onondaga Iroquois: Accommodating Change, 1500-1655* ([1987] 2005) that throughout the early seventeenth century, copper-alloy material was reworked predominately into new forms for adornment purposes (Bradley [1987] 2005:132-5). However, at later seventeenth-century Native American sites, while copper-alloy material was still being reworked into new forms, more copper-alloy objects were retained in their original European forms (Bradley [1987] 2005:133-9). Bradley found that "after 1650 almost any small copper or brass item made or used in northern Europe...could and often did occur on Iroquois sites" (Bradley [1987] 2005:139). The Townley-Read assemblage contains most of the European forms of copper-alloy pieces that Bradley mentions, including "bells, thimbles, buttons, mouth harps, religious ornaments" (Bradley [1987] 2005:135).

Townley-Read Site Assemblage and Modifications

Objects made from the European copper-alloy trade goods acquired by Native Americans served both utilitarian and adornment purposes. These differences in how the copper-alloy items were manipulated from their original form and used in Native society are evident in the contents of the approximately 1137-item copper-alloy assemblage from Townley-Read. The total number of objects that were used or modified for utilitarian purposes was 56, and the total number of objects used or modified for adornment was approximately 880. The remaining 201 items consist of manufacturing debris/raw materials and miscellaneous objects. Some of the items in the assemblage appear not to have been physically modified by the Seneca people. However, these items may or may not have been used by the Seneca people at Townley-Read in the manner that was intended by Europeans upon their manufacture. The artifacts in the assemblage were found in four types of context, three of which comprise the RMSC collections (surface-collected, unknown, burial) and the fourth consisting of the artifacts at Cornell (Townley-Read/New Ganechstage Project (TRNG)) from domestic contexts (see Table 1).

Utilitarian Copper-Alloy Materials

The majority of copper-alloy objects used by Native Americans were non-utilitarian, but utilitarian items found in copper-alloy assemblages include saws, projectile points, needles, awls, and cutting and scraping tools (Ehrhardt 2005:75). Copper-alloy artifacts recovered from the Townley-Read Site used for utilitarian purposes are significantly less numerous than items used for adornment (see Table 2) .

Unmodified Artifacts

The kettles, spoons, mouth harps, and handle present in the copper-alloy assemblage from Townley-Read are of European manufacture and do not appear to have been significantly modified. The kettles are still in their original form, although corroded and broken, and had not been taken apart so that their sheet metal could be used to make other objects. Although not all of the spoons, mouth harps, and handles are still intact, they do not appear to have been modified from their original European forms. It is difficult to determine how the spoons were incorporated into Seneca culture, but since the metal does not show signs of purposeful alterations, they may have been used for dining purposes. The six mouth harps appear unmodified, and the handle may have been removed purposefully or accidentally from the larger object to which it had been once attached.

Kettles

There are four copper-alloy kettles in the Townley-Read collection, although Wray excavated other kettles that are not preserved at RMSC (Jordan, personal communication 2007). These four kettles are European manufactured and are still in their original forms. Three of the kettles are similar in form; the fourth kettle (6642/160) is badly crushed making its original shape difficult to decipher. Three kettles (6642/160, 6508/160, and 6103A/160) are from burial contexts; kettle 6642/160 was found at the surface of a

Table 1. Townley-Read Copper-Alloy Assemblage Summary Chart

Material		**Surface-Collected (RMSC)**	**Unknown (RMSC)**	**Burials (RMSC)**	**Domestic Context (TRNG)**	**Total**	**Percent of Total (100%)**
Utilitarian							
Awl		1				1	
Fishhook		1	1			2	
Handle			1			1	
Kettles			1	3		4	
Mouth Harps		1	2	2	1	6	
Pins			30*			30*	
Pipe			1			1	
Projectile Points			6		3	9	
Spoons			1	1		2	
Total		*3*	*43**	*6*	*4*	*56**	*4.9%*
Utilitarian Total %		*5.4%*	*76.8%*	*10.7%*	*7.1%*	*~100.0%*	
Adornment							
Bangles		5	50	109	1	165	
BeadStyle	*Seed*		57*	429*		486*	
	Spring	2		72*		74*	
	Tubular	1	2	2	1	6	
Bells			2	18		20	
Bracelets				3		3	
Braid/Cloth			2*	3*		5*	
Buckles		1	1	1		3	
Buttons			12	3		15	
Crucifixes		2				2	
Medals		4	2	16		22	
Necklaces				3		3	
Orn./Spirals			4		1	5	
Pendant		1				1	
Rings		4	4	56	1	65	
Thimbles			5			5	
Total		*20*	*141**	*715**	*4*	*880**	*77.4%*
Adornment Total %		*2.3%*	*16.0%*	*81.3%*	*0.5%*	*~100.0%*	
Manufacturing Debris/Raw Materials							
Fragments		20	118*	5	45*	188*	
Kettle Ears		2	3			5	
Kettle Patches		2				2	
Total		*24**	*121**	*5*	*45**	*195**	*17.2%*
Debris Total %		*12.3%*	*62.1%*	*2.6%*	*23.1%*	*~100.0%*	
Miscellaneous		1		2	3	6	0.5%
Misc. Total %		*16.7%*		*33.3%*	*50.0%*	*~100.0%*	
Total		**48***	**305***	**728***	**56***	**1137***	**~100.0%**
Percent of Total (100%)		**4.2%**	**26.8%**	**64.0%**	**4.9%**	**~100.0%**	

*estimated number

Table 2. Townley-Read Utilitarian Copper-Alloy Materials

Material	**Surface-Collected (RMSC)**	**Unknown (RMSC)**	**Burials (RMSC)**	**Domestic Context (TRNG)**	**Total**
Awl	1				1
Fishhook	1	1			2
Handle		1			1
Kettles		1	3		4
Mouth Harps	1	2	2	1	6
Pins		30*			30*
Pipe		1			1
Projectile Points		6		3	9
Spoons		1	1		2
Total	3	43*	6	4	56*

*estimated number

Figure 1. Kettle 8 (No catalog #) from the Townley-Read Site (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

Figure 2. Kettle (6642/160) from the Townley-Read Site (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

cemetery area, and the other two kettles were found within graves.

Kettle 8 (Figure 1) was excavated from an unknown context and does not have a catalog number. The bottom of this kettle is torn and the metal is rising into its interior. The kettle is 65.0 mm deep and 160.0 mm in diameter. The metal of the kettle is 0.6 mm thick. The rim appears to be made of sheet metal folded over a metal wire. The rim is 8.4 mm thick and 9.3 mm tall. There are two lugs on either side of the kettle; both lugs have two rivets and one hole. The two rivets are side by side and attach to the kettle's exterior. The hole is on the piece of the lug that rises above the rim of the kettle, and through this, the bail would loop. The lugs are 40.6 mm wide and 37.5 mm tall. The rivets may be iron for they are orange and rusty. The bail is iron, and only fragments of it remain, mainly just inside of the lugs. Catalog number 6642/160 (Figure 2) is a small kettle that was plowed up from a burial site and clearly damaged in the process; pieces of the kettle are missing, and it no longer maintains a rounded shape. The rim of the kettle is intact and demonstrates how the metal was rolled over a piece of metal wire to form the rim. The rim is 4.2 mm thick and 4.1 mm tall. Bail holes on each side of the kettle are also apparent. The kettle is 66.5 mm deep, and the diameter is widest at 134.3 mm and narrowest at 93.4 mm. The metal of the kettle is 1.1 mm thick.

Item 6508/160 is on display at RMSC and could not be closely analyzed. The artifact is a small kettle in good condition. Like the other two kettles, part of the rim overlaps metal wire and there are lugs on either side of the kettle that loop over the top of the rim. The kettle has no bail remnant and is rusted on the inside and on the lugs. The sides of the kettle are sloped like the other two kettles, and it does not appear to be very deep. Item 6103A/160 is the largest of the four kettles. The bottom of the kettle is broken off from the rest of the kettle and only the very flat part of the bottom remains. The kettle has a rim like the other three kettles (7.6 mm tall), but unlike the other three, the bail is still present (it is 5.9 mm thick and 6.3 mm wide). Its lugs are identical to that of Kettle 8. There is also a small bag of brown fragments of metal that might have been a part of this kettle at one point. The kettle is 100.0 mm deep and 235.0 mm in diameter. The metal of this kettle is 0.7 mm thick.

Kettles at the Tunica Site (1731-1764) in Louisiana recorded by Jeffrey P. Brain closely resemble these from Townley-Read, in that "the metal, originally averaging less than 1 mm in thickness, is often very worn or cracked (patches attached with copper rivets to the bottoms and sides are common), and frequently the bottoms are missing" (Brain 1979:1, 164). The Townley-Read kettles were most likely produced through the typical means of European manufacture of kettles, which involved casting and forging (Anselmi 2004:152). Based on overall shape and lug form, Kettles 8 and 6103A/160 match the Type A, Variety 1 in Brain's typology (Brain 1979:166-7). Both kettles have ears that were made from sheet brass and were "folded over and placed astraddle the rims," which they were fastened to "with two copper rivets" (Brain 1979:166). The poor condition of 6642/160 makes it difficult to determine its type, and since 6508/160 is on display at RMSC, it could not be examined closely enough for a classification to be established.

Spoons

There are two spoons of European manufacture in the Townley-Read collection. One spoon (6016/160) is on display at RMSC; it is fully intact and has a long thin handle which arches up at the base of the bowl. There is a perforation on the handle. The bowl of the spoon is ovular but crinkled around the edges, which is likely due to corrosion (RMSC Exhibition Condition and Recommendation Report). The handle of the other spoon (6036/160) has broken off, so only the bowl remains (with a maximum width of about 37.2 mm). The base of the bowl has a triangular groove on the back, and there are etchings and scratches on the back as well. The remainder of the bowl, including the edges, is smooth.

Mouth Harps

There are six mouth harps in the Townley-Read assemblage; five are at RMSC and one is in the Townley-Read/New Ganechstage Project collection (see Table 3). The majority of the mouth harps have flat heads, but 6716/160 has a rounded one. The metal from which the harps were formed

Table 3. Mouth Harp Dimensions

	Stem Length (n=5)	Stem Width (n=3)	Stem Thickness (n=5)	Head Width (n=5)	Head Thickness (n=5)
Avg. (mm)	41.8	8.9	3.8	26.8	3.4

has four sides, and this square shaped metal wire was then fashioned into the harp shape. Mouth harps 6129/160, 6130/160 (Figures 3a and b), and 15000/160 have flattened heads which match Lyle M. Stone's typology of mouth harps with "flattened frame heads" (Stone 1974:141-143, figure 76B, Series A, Type 2). Harp 6590/160 is on display at RMSC so it could not be closely examined, but it too had a flattened head. Item 6716/160 has a rounded head and is closer to Stone's depiction of "round frame head" mouth harps (Stone 1974:141-143, figure 76F, Series B, Type 1, Variety A). Only one of the stems remains from the mouth harp at Cornell University (TR518.36.), but the head appears to be rounded and similar in form to 6716/160, except that

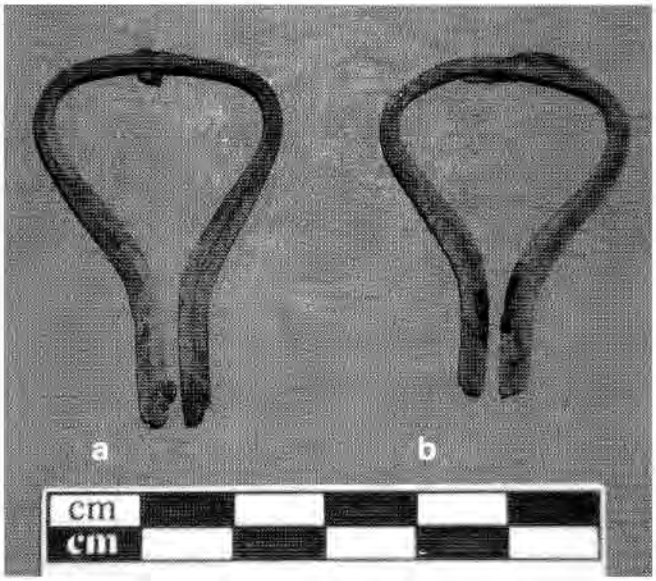

Figure 3. Copper-Alloy Mouth Harps from the Townley-Read Site: a. 6129/160; b. 6130/160 (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

Figure 4. Copper-Alloy Projectile Points (6002/209) from the Townley-Read Site (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

its stem flares outwards while the stems of 6716/160 are parallel to one another.

Handle
There is one piece in the Townley-Read collection that appears to have been broken off a larger object. It is oval in shape and has a hole through its middle. It is 35.6 mm long, 13.5 mm wide, and 2.1 mm thick.

Modified Artifacts
Projectile points, an awl, a fishhook, pins, and a pipe were made out of reworked copper-alloy metal.

Projectile Points
Nine projectile points were found at the Townley-Read Site. They average 29.1 mm in length, 15.0 mm in width, and 0.9 mm in thickness. The majority of the projectile points are isosceles triangles (TR569.8, TR572.9, 6054/160, and 15049/160), but there are also diamond-shaped points (TR571.12), irregular triangular points (6002/209), and points that have one straight side forming a right angle with its base (6005/160). Three projectile points make up 6002/209 (Figure 4), and the shaft and hafting are preserved for all three. One point has a small hole in the triangle and four strands of material threaded through it. The shaft and hafting are also preserved for 6054/160 and a stringy material is threaded through a small hole in the triangle to attach the wooden shaft to the base of the triangle. Item 6005/160 could possibly be a spear point and has a fold in its middle as if it was bent from a form of applied pressure. One point (TR572.9) is bent as well, and there is a hole near the point of the triangle, presumably used for hafting.

There are traces of cutting on the metal edges of the triangular-shaped points and perforations can be found on several of the points. Anselmi explains that metal pieces triangular in shape with no stems or tangs could have been made in various ways, "chiseling, scoring and bending and cutting using snips or scissors" (Anselmi 2004:230). Several of the points had stems which facilitated hafting, and according to Anselmi, points "were often chisled or scored and bent along the edges and the stem/tang projection" (Anselmi 2004:232).

Awl
There is one copper-alloy awl in the Townley-Read collection, 19/160. It is significantly bent and has three folds. One end is flat and right angled (7.3 mm wide), and the other end is a triangular point. The awl is 0.4 mm thick. It closely resembles the projectile points, especially since it is made of a flat metal, and may have been made in a similar manner. The flat awls at the 1605-1625 Seneca Dutch Hollow Site were "multiply incised, bent, and broken along the striations, and then ground to a fine, sharp point at one end" (Sempowski and Saunders 2001:19, 111), which matches the description of the awl from Townley-Read.

Fishhook and Possible Fishing Lure
One wire fishhook (6021/160) is in the Townley-Read collection (see Table 4). This type of find is rare; Anselmi's extensive study of copper-alloy artifacts found hooks in only two collections from 68 archaeological sites and two amalgamated collections (Anselmi 2004:ii, 253). The metal of the fishhook is square-shaped. One end of the wire was folded over, and the other end has a sharp tip. The method for making 6021/160 is uncertain, but since it is formed out of a square-shaped wire, it is possible that this metal piece was taken from another source and reworked into its hook-like shape. The tip is sharp and may have been created through a grinding process similar to the process used for awls (Sempowski and Saunders 2001:111).

There is also a possible fishing lure in the collection (15078/160). It is a piece of metal rolled so that its ends do not join. It has a silvery appearance and may not be copper-alloy metal. It is also likely to be from a later context (Jordan, personal communication 2007).

Pins
There are approximately 30 copper-alloy pins on display at RMSC (6001/209). These pins appear to be flat on one end and pointed on the other. They are pierced vertically through a brown textile material. The pins in the assemblage may be of European manufacture (Brain 1979:189), but they could not be closely examined. They also may have been ground since they have sharp points.

Pipe
One copper-alloy smoking pipe exists in the Townley-Read collection and is currently on display at RMSC. According to RMSC's Exhibition Condition and Recommendation Report, item 6004/160 has a 125.0 mm long stem and a 50.0 mm long bowl. Anselmi examined one pipe from the Dutch Van Curler House/Schuyler Flatts Site that was formed "through the use of scoring and bending, with rolling and grinding used as finishing techniques" (Anselmi 2004:208).

Table 4. Fishhook Dimensions

Catalog #	Length (mm)	Width (mm)	Metal Thickness (mm)
6021/160	29.8	3.2	1.4
15078/160	68.0	12.2 (side 1) & 9.7 (side 2)	1.5

Table 5. Townley-Read Adornment Copper-Alloy Materials

Material		Surface-Collected (RMSC)	Unknown (RMSC)	Burials (RMSC)	Domestic Context (TRNG)	Total
Bangles		5	50	109	1	165
BeadStyle	*Seed*		57*	429*		486*
	Spring	2		72*		74*
	Tubular	1	2	2	1	6
Bells			2	18		20
Bracelets				3		3
Braid/Cloth			2*	3*		5*
Buckles			1	1		3
Buttons			12	3		15
Crucifixes		2				2
Medals		4		16		22
Necklaces				3		3
Orn./Spirals			4			5
Pendant		1				1
Rings		4	4	56		65
Thimbles			5			5
Total		20	141*	715*	4	880*

*estimated number

Adornment Copper-Alloy Materials

The majority of the pieces in the Townley-Read copper-alloy assemblage can be categorized as adornment or decorative items. Similar to the utilitarian pieces in the assemblage, there are both modified and unmodified objects (see Table 5).

Unmodified Artifacts
Unmodifed copper-alloy objects used for adornment include bells, buttons, buckles, braid/cloth, crucifixes, rings, and medals.

Bells
There are 20 bells from the Townley-Read Site, including 19 "hawk" bells (see Table 6) and one "sleigh" bell. "Hawk" bells were made by Europeans and were small in size (Anselmi 2004:290). They resemble the "Flush-edge Type, Variety Flushloop" bells made of sheet brass, which is described as "two bowl-like hemispheres which are then placed together flush and joined by soldering or brazing" (Jelks in Brain 1979:201). These bells were likely "either cast in a mold or molded out of sheet metal" (Brain 1979:197). They have loops made out of thin sheet brass,

Table 6. Bell Dimensions

	Height (n=10)	Height with Hook (n=9)	Diameter (n=10)	Metal Thickness (n=8)
Avg. (mm)	12.8	18.0	16.0	1.2

which served to suspend the bell (Brain 1979:201). It is likely that these bells were incorporated into articles of clothing (Ehrhardt 2005:130).

Items 6055/160 and 6056/160 are extremely small. The first (6055/160) is 9.6 mm tall with the hook and 7.5 mm wide, and the other (6056/160) is 9.8 mm tall with the hook and 7.7 mm wide. These two bells may have been used as earrings. Bells 6273/160 and 6274/160 both clearly display two separate hemispheres that were joined together, but both bells are covered in cracks. Bells 6308/160 and 6309/160 have this same hemispherical make up, but it seems that the material inside of the hollow of the bell is still present in both pieces. There is a piece inside of 6308/160 that is still moving, and the bottom half of 6309/160 is partially removed from its top half revealing the ball inside of the bell. Bells 6363/160 and 6364/160 (Figure 5) are in good

Figure 5 Copper-Alloy Bells from the Townley-Read Site: a 6363; b. 6364/160 (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

condition and demonstrate how they are made up of two halves that were ground and joined together. 6310/160 is made up of four different fragments. They have corroded exteriors and brown metallic material on their interior sides. The only "sleigh" bell in the assemblage is cataloged as 6127/160; it is attached to a leather thong. Since it is on display, measurement and close examination were not possible. There are a total of 10 bells, including the sleigh bell, on this leather string, and the leather is knotted between each bell.

Buttons

Fifteen manufactured buttons of a variety of shapes and sizes were found at the Townley-Read Site (see Table 7). The buttons exhibit European manufacturing techniques, including casting, brazing, and soldering (Brain 1979:189). It is possible that these buttons were introduced to the site on European clothing that was traded into the Seneca community (Brain 1979:190). Buttons 6046-50/160 (Figure 6) are similar in shape and design. They consist of convex faces with wire eyes attached to the interior. Items 6048/160 and 6050/160 have larger eyes than the others, while 6047/160 is slightly different because its eye is situated vertically and not horizontally and also has another eye caught within it. The eyes of 6046/160 and 6047/160 are off center. Buttons 6046-50/160 resemble the shape of the buttons depicted in Stone's typology of buttons (1974:48-49, figure 27G, Class (C.) I, Series (S.) B, Type (T.) 5, Variety (V.) A), except that the faces of the buttons from Townley-Read are more concave. 6396/160 is similar but larger and its eye is centered.

Table 7. Button Dimensions

Catalog #	Average Diameter (mm)	Face Thickness (mm)	Average Depth/Thickness with Eye (mm)
6005/209	18.0	6.2	
6046-50/160	10.9	3.4	9.4
6396/160	28.4	1.5	13.3
6039/160	28.1	10.6	17.1
6040/160	30.6	1.2	7.2
6041/160	35.9	1.0	
6051/160	11.7	0.3	
6114/160	19.5	1.8	
6272/160	19.8	8.3	15.2
10579/160	28.9	9.2	

Item number 6039/160 is hollow and has a textured face of little checkered-squares, similar to a button depicted in Stone (1974:52-55, figure 29M, C.III, S.A, T.1, V.g). The checkers have light brown outlines and dark colored fill. Button 6040/160 is flat, with a little curve near the edges, and the eye is near the middle of its back. Button number 6041/160 is not perfectly flat and its eye is broken off of its back. It has a stamped leaf pattern around the edges of the face, similar to Stone's depiction (1974:48-49, figure 27H, C.I, S.B, T.5, V.b). Item 6051/160 is another flat button with two holes.

Catalog number 6114/160 is a carved out dome with its eye within the concave. The edges of the button are smooth, and it is round in shape (Stone 1974:50-51, 53, figure 28H, C.I, S.D, T.4, V.b). The inside concave has a ridge around the perimeter. Button 6272/160 has a dome face that is very thick and solid, while 15079/160 is an oval shaped button and its eye is a loop of metal with a stem. The oval is punctured so that the stem of the eye is fastened to the button from the inside of the face. The ovular face is one piece and perhaps might have been made from a circular piece of metal that was rolled up and joined. The seam where the metal is joined into an oval is not neat and has an overlap. Finally, there are two buttons cataloged as 6005/209 that are not made out of copper-alloy, but wood; however, they have thin strips of copper-alloy metal woven together over the buttons' faces. There is also metal on the back of the buttons. These strips of wire are 0.4 mm thick.

Buckles

Three buckles have been found at the Townley-Read Site; all are of European manufacture. There do not appear to be any Native American modifications to the buckles. They are distinct from one another in size and shape (see Table 8). Buckle 17/160 has three circular holes across it, and beneath

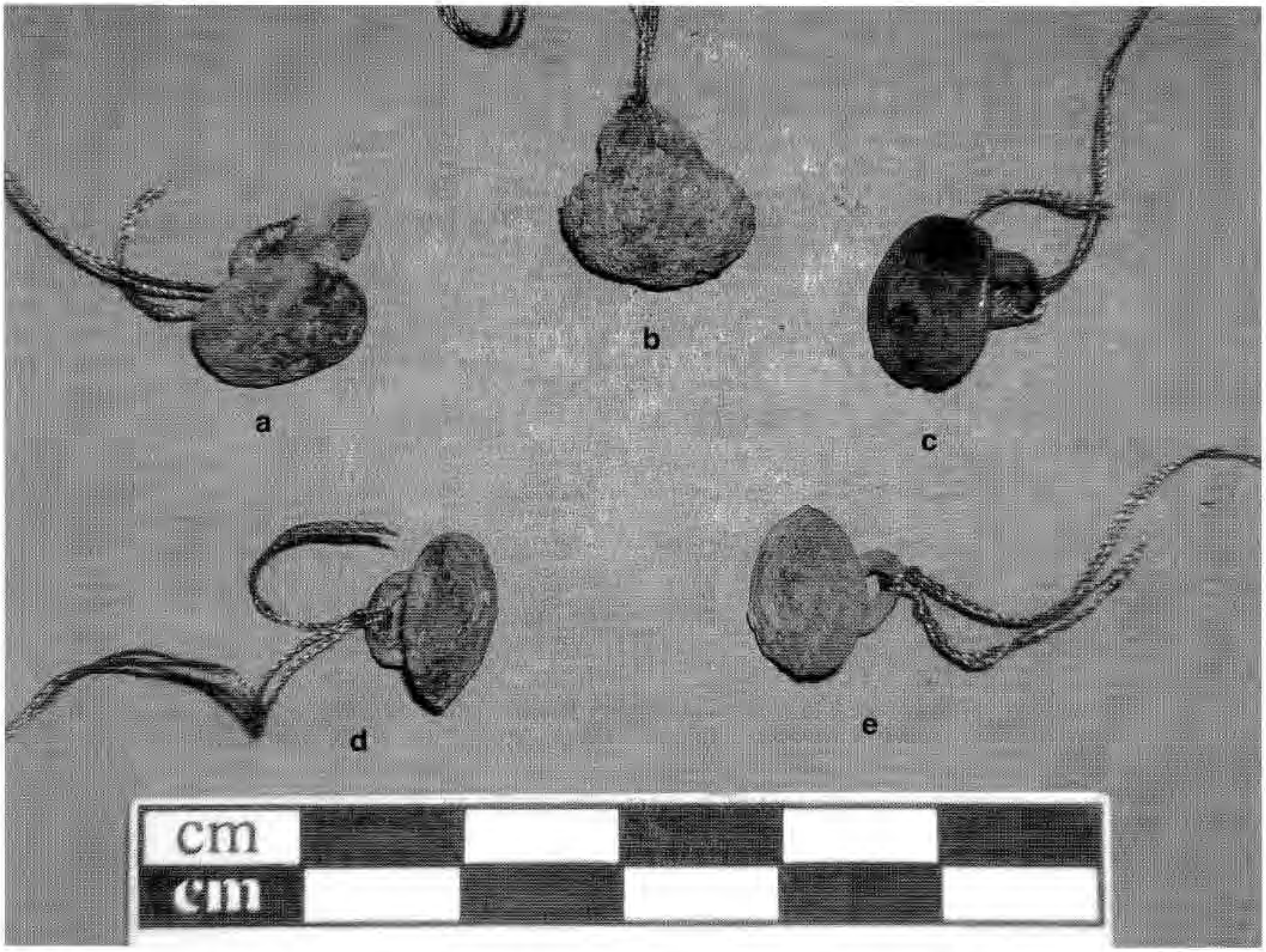

Figure 6. Copper-Alloy Buttons from the Townley-Read Site: a. 6046/160; b. 6047/160; c. 6048/160; d. 6049/160; e. 6050/160 (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

Table 8. Buckle Dimensions

Catalog #	**Length/Width** (mm)	**Height** (mm)
17/160	40.1	13.2
6368/160	27.5	37.0*
15801/160	38.8	41.3

*estimated number

these holes are two rectangular punctures. The base of the buckle is 5.2 mm thick and the top is 1.8 mm. The edges are not straight but are fashioned into a curved design. Buckle 6368/160 (Figure 7) has two small holes through the width of its vertical sides where material must have been strung. The buckle is also arced forward and has a polished surface on the front while the back is dull; it is about 1.8 mm thick, except over the holes on the sides where it is 4.0 mm thick. The band width varies throughout the buckle, the maximum

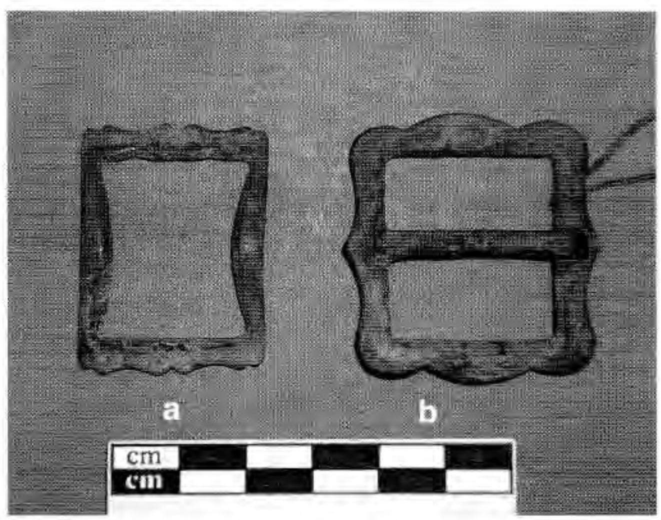

Figure 7. Copper-Alloy Buckles from the Townley-Read Site: a.6368/160; b.15081/160 (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

being 5.6 mm and the minimum 4.4 mm. Lastly, buckle 15081/160 (Figure 7) has a horizontal hook and engraved curves in its frames. The hook is 33.0 mm long and 3.5 mm wide. The frame is 2.8 mm thick and 6.4 mm at its maximum width.

Braid/Cloth

There is no definitive number of how many pieces of military braid are in the Townley-Read collection because the braid has corroded into many fragments. However, there are five catalog lots. The remnants of the braid are fragments that come in various shapes, sizes, and levels of preservation (see Table 9). All of the pieces consist of cloth material that has thin strands of copper-alloy metal interwoven with thread to give the braid a texture. The metal strands are woven together in a crosshatch pattern. Most of the braid at RMSC is kept in sealed boxes because of the fragility of the material, and therefore, precise measurements could not be taken of several cataloged items. The metal strands tend to be corroded and green in color, which has stained the preserved cloth green as well. The edges of the fragments are also generally frayed. The strips of metal would have been European-made and sewn onto the cloth using European techniques. This braid was once a part of European clothing, perhaps military clothing (Carman 1957:40-42). It may have been used as "metallic braid, or galloon,...used to adorn clothing in the eighteenth century" (Brain 1988:412, Appendix F, Section 4).

Catalog number 6320/160 consists of about 24 fragments of braid that are in different states of preservation. Some of the strands of metal are still tightly woven together, while others have loosened and are falling apart. Materials cataloged as 6330/160 may be associated with 6320/160, but it has been stored separately. The material included with these pieces of braid is of a different consistency and looks like fur as opposed to cloth. The pieces that seem to be fur are oval and circle shaped, while the strands of green tinged cloth are rectangular. Item 6372/160 is a fragment of very loose crosshatched metal; the thickness of the strands of metal is 0.3 mm. Catalog item 6004/160 is in a box and consists of four separate fragments, and item 6001/160 is enclosed in a box, as well, and has four fragments of braid lined up in a column.

Crucifixes

There are two crucifixes in the Townley-Read collection. and both are on display at RMSC so they could not be closely inspected. One of the crucifixes is smaller than the other and of a thinner metal. From the information provided by the RMSC's Exhibition Condition and Recommendation Report, 6028/160 most resembles one of Stone's illustrations (1974:119, 122-123, figure 55D, S.A, T.2, specimen 2). There is only a depiction on one side of the crucifixes, so it is unclear whether or not the object has images on both of its sides or just one side. The report states that this crucifix is 35.0 mm tall and 22.0 mm wide, and shows that the crucifix has a figure of a man on the cross with a small circle and an "x" underneath his feet. No RMSC Examination and Treatment Report could be located for item 6029/160, and the image could not be seen clearly. These crucifixes were most likely given to the Senecas by missionaries (Brain 1988:411, Appendix F, Section 4). They were European-made and do not show signs of physical alteration by the Senecas. There are remnants of images on the metal of the crucifixes, and the significance of these objects to the Senecas at Townley-Read is not certain.

Rings

Figure 8 and Figure 9

A. Jesuit-Style Rings

There are 28 rings from the Townley-Read Site that may be classified as Jesuit-style rings (see Table 10). The rings are most likely European manufactured, "formed by a single-piece band and flat bezel which may be round, oval, octagonal, irregular octagonal, or heart-shaped" (Cleland 1972:202). The faces of the rings in the collection exhibit various bezel shapes, including ovals, octagons, and hearts. Two types of classification have been used to identify the different rings in the collection; one is by Lyle M. Stone and the other is by Charles E. Cleland. Cleland's classifications show the change in Jesuit ring styles over time; he addresses "the rate and direction of style changes" and "the sequential

Table 9. Braid/Cloth Dimensions

Catalog #	Length (mm)	Width (mm)
6001/160	74.1	32.1 (Max.)
6004/160	Sides range from 19.8 - 47.3	
6320/160	10.0 (smallest piece), 33.1 (largest piece),	3.1 (smallest piece) 16.2 (largest piece)
6330/160 (larger piece)	157.0	37.0
6372/160 (largest piece)	29.2	3.7

Figure 8. Copper-Alloy Jesuit-Style Rings from the Townley-Read Site: a. 6137/160; b. 6139/160; c. 6140/160; d. 6141/160; e. 6142/160; f. 6144/160; g. 6145/160; h. 6146/160 (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

progression of stylistic change" of designs on ring faces (Cleland 1972:202). The ring faces also have "designs, symbols, and letters" that were "either cast in raised relief or engraved on the bezel" (Cleland 1972:202). According to Cleland, the variation of the engravings implies that "they were carelessly mass produced at a rapid rate" (Cleland 1972:207). Engravers of Jesuit rings most likely made their designs by using "previous replications instead of prototypes which were no longer available" (Cleland 1972:209).

The rings in the Townley-Read assemblage show stylistic variation and include rings from the three distinct series that Cleland identified in his study, the *IHS* series, Double-*M* series, and *L*-Heart series (Cleland 1972:203-6). The *IHS* in the *IHS* series means in Latin "'*Isus Hominis Salvator*' or 'Jesus Savior of Mankind,'" and the "M" in the Double-*M* series means in Latin "'*Mater Misericordia*' or 'Mother of Mercy'" (Cleland 1972:205). The "L" in the *L*-heart series does not have a known meaning (Cleland 1972:203); however, "L" might represent the French King "Louis," and the heart "could be a symbol of loyalty to the king" (Mason 2003:240; Wood 1974:84).

Three of these rings are on display at RMSC and their measurements could not be taken. However, width and height measurements for these rings were found in RMSC's Exhibition Condition and Recommendation Reports. One of the rings, 6326/160, could not be located, and ring TR538.11 was the only ring in the Cornell University collection.

Three rings (13/160, 6069/160, and 6136/160) resemble depictions of Cleland's *IHS* series, *F-P-D* ring progression (Cleland 1972:206). Ring 13/160 (Figure 9) no longer has a complete band and is different from Cleland's examples because it is octagonal, not oval. It also resembles Stone, figures 60I and 60P (1974:127, 129, 132-133, C.II, S.A, T.3, V.e & 1), but as with Cleland's series, it differs due to its octagonal shape. Item 6069/160 has an octagonal shape as well, but its edges have worn smooth. Rings 13/160 and 6069/160 resemble later stages of Cleland's progression diagram (1972:206) and are mainly just "H" shaped, while ring 6136/160 appears to be earlier in the progression and still has "IHS" on its face. Beneath the letters "IHS," there is

Figure 9. Copper-Alloy Jesuit-Style Rings from the Townley-Read Site: a. 6183/160: b 6184/160: c. 2/160: d. 3/160; c. 13/160 (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

an x-shaped mark. Ring 6322/160 may have derived from the *IHS*-series as well but is closer to Stone's drawing (1974:127, 129-131, figure 59t, C.II, S.A, T.2, V.i). It has a shield-shaped carving on its face but has more vertical lines than either Cleland or Stone's depictions.

Nine rings appear to fall into Cleland's Double-*M* Series, eight of which are of the *X*-ring progression (examples appear in Figures 8 and 9) (Cleland 1972:205) (see Table 11), and one ring fits Cleland's *A*-ring progression (Cleland 1972:205). Eight rings resemble Cleland's *L*-heart Series (Cleland 1972:203); three of these rings (Table 12) are of the "rended-heart ring progression" (an example in Figure 8) (Cleland 1972:203-204). The engraving on the face of 6369/160 occurs below a horizontal line drawn across the middle of the heart, and 6370/160 has a similar pattern. Ring TR538.11 is heart shaped and has an oval etched into the middle of its face with rays carved on the outside of it (similar to Stone 1974: p. 127, 129, 132-133, figure 60F, C.II, S.A, T.3, V.b). There are three rings (see Table 12) of the *N*-ring progression (Cleland 1972: 203-4). Items 6182/160 and 6323/160 have similar designs, but it appears that a box might have been etched around the "VI" on the face of 6323/160. Ring 6329/160 has a "V" design but is hard to decipher since the metal has been badly corroded. Catalog number 6183/160 (Figure 9) does not precisely fit any of the progressions, but it appears to fall into Cleland's *L*-heart progression of the *L*-ring series (Cleland 1972:203).

The remaining rings (see Table 13) do not fit into the different Cleland progressions and are closer to ring types illustrated by Stone (1974). Ring 6143/160 (RMSC Exhibition Condition and Recommendation Report) and 6146/160 are similar, but the face of the second is taller. Ring 6325/160 resembles Stone's illustration (Stone 1974) but has a line instead of a star. Item 6327/160 also resembles Stone's illustration but the letters are more curved; item 6328/160 is comparable to Stone (1974) as well but does not have a star.

Table 10. Jesuit Ring Dimensions

Average Diameter (mm) (n=18)	Average Face Width (mm) (n=23)	Average Face Height (mm) (n=27)	Average Face Thickness (mm) (n=22)	Average Band Width (mm) (n=21)	Average Band Thickness (mm) (n=21)
19.4	12.1	9.9	1.6	2.5	1 4

Table 11. Jesuit Ring Descriptions

Catalog #	Face Shape	Face Design	Cleland (1972) Typology	Stone (1974) Series/Type
6139/160	Oval	"XX"	Double-*M* series, *X*-ring progression	p. 127, 129-131, figure 59Q, (C.II, S.A, T.2, V.f)
6140/160	Heart-shaped	Oval/egg	Double-*M* series, *X*-ring progression	p. 127, 129, 132-3, figure 60D, (C.II, S.A, T.2, V.o)
6141/160	Heart-shaped	"MX"	Double-*M* series, *X*-ring progression	p. 127, 129-131, figure 59Q, (C.II, S.A, T.2, V.f) & p. 127, 129, 132-3, figures 60C, 60Q, & 60R, (C.II, S.A, T. 2, V.n & C.II, S.A, T.3, V.m&n)
6142/160, 6144/160, 6145/160	Heart-Shaped	Oval/egg	Double-*M* series, *X*-ring progression	p. 127, 129, 132-3, figure 60D, (C.II, S.A, T.2, V.o)
6184/160	Oval	Oval/egg	Double-*M* series, *X*-ring progression	p. 127, 129, 132-3, figure 60D, (C.II, S.A, T.2, V.o)
6324/160	Octagonal	"XX" with lines above and below	Double-*M* series, *X*-ring progression	p. 127, 129, 132-3, figure 60R, (C.II, S.A, T.3, V.n)
6068/160	Octagonal	"M"	*A*-ring progression	p. 125, 127-8, figure 58Q, (C.II, S.A, T.1, V.h) and p. 127, 129, 130-1, figure 59S, (C.II, S.A, T.2, V.h)

Table 12. Jesuit Ring Descriptions

Catalog #	Face Shape	Face Design	Cleland (1972) Typology	Stone (1974) Series/Type
6369/160	Heart	Oval/egg	*L*-heart series, rendered-heart progression	p. 127, 129, 132-3, figure 60F, (C.II, S.A, T.3, V.b)
6370/160	Horizontal oval	Oval/egg	*L*-heart series, rendered-heart progression	p. 127, 129, 133-2, figure 60F, (C.II, S.A, T.3, V.b)
6137/160	Oval	Heart with lines raying out from top	*L*-heart series, rendered-heart progression	p. 127, 129-131, figure 59O, (C.II, S.A, T.2, V.d)
6182/160	Octagonal	"VI"	*L*-heart series, *N*-ring progression	
6323/160	Horizontal oval	"VI" with box	*L*-heart series, *N*-ring progression	p. 125, 127, 130-131, figure 59B, (C.II, S.A, T.1, V.k)
6329/160	Heart		*L*-heart series, *N*-ring progression	

B. Non-religious rings

The non-religious rings fall into three categories: bands, spring rings, and glass bezels. The rings with glass bezels are most likely European-made. The bands and spring rings, however, may fall into the modified category for copper-alloy adornment objects. The bands could have been made from copper-alloy sheet metal or wire that was rolled so that the ends meet (Wray et al. 1991:80). The spring rings or "coils" were probably made from thin wire (Anselmi 2004:195).

The bands are single rings of copper-alloy metal with a band width of 3.0 mm and band thickness of 1.5 mm. The majority of the rings in the collection are in multiple pieces or only fragments of the original ring, but from the pieces remaining, the average width of the bands appears to be about 15.2 mm. Items 6015/160 and 6270/160 are the only whole bands, and 6270/160 is caught inside of 6269/160, which has a larger diameter. Band 6116/160 is in five frag-

Table 13. Jesuit Ring Descriptions

Catalog #	Face Shape	Face Design	Stone (1974) Series/Type
6143/160	Heart	Curved lines in lobes of heart	p. 127, 129, 132-3, figures 60E & 60K, (C.II, S.A, T.3, V.a & g)
6146/160	Heart	Curved lines down length of heart	p. 127, 129, 132-3, figure 60H, (C.II, S.A, T.3, V.d)
6325/160	Octagonal	Heart inside geometric shape	p. 125, 127, 130-1, figure 59A, (C.II, S.A, T.1, V.j)
6327/160	Horizontal Oval	"ID"	p. 125, 127-9, figure 58K, (C.II, S.A, T.1, V.c)
6328/160	Heart	Curved lines on edges of heart	p. 127, 129, 132-3, figure 60E, (C.II, S.A, T.3, V.a)

Table 14. Medal Dimensions

	British Royal	French Jesuit
Avg. Diameter (mm)	34.9 (n=6)	20.5 (n=9)
Avg. Height (mm)	35.5 (n=6)	23.5 (n=10)
Avg. Height w/loops (mm)	36.0 (n=4)	30.0 (n=10)
Avg. Thickness (mm)	1.6 (n=6)	1.4 (n=10)

ments, 6271/160 and 6371/160 are both in three pieces, and 6640/160 is in six pieces. Only one fragment remains of 6117/160.

The spring rings have multiple coiled layers, and the average diameter of the rings is 17.1 mm, average height is 7.1 mm, average band width is 1.4 mm, and average thickness of the band is 1.3 mm. Items 6507/160 and 6229/160 both have five levels of coil, but one of the layers of 6229/160 is cut in half. Catalog number 6230/160 has ten layers and each layer is uniform in size. There is space in between each of the layers. Item 6269/160 has three layers of coil, and 6270/160 is caught within it. Item 6321/160 is on display at RMSC and is a ring of many coils in a uniform column. The RMSC collections include four rings with blue glass bezels for their faces and one with a white colored glass. In each case, the glass is embedded inside hollow concaves of metal. Ring 2/160 (Figure 9) has a blue glass face with a lion etched into the glass; there is a ridge in the metal holding the glass so that the glass is securely fastened to the ring. The width of the glass is 11.8 mm and the width of the face including the metal is 13.6 mm. The glass is 2.8 mm thick and the total thickness of the face is 4.2 mm. Part of the band is missing but the width is 3.3 mm and its thickness is 1.7 mm. A second ring, 3/160 (Figure 9), is similar to 2/160 but has a profile of a man's bust looking towards the right etched into the glass instead. The diameter of the ring is 14.3 mm and the height of the face is 11.4 mm. The width of the glass is 11.0 mm and the width of the face including the metal is 13.0 mm. The width of the band, of which a part of it is missing, is 3.1 mm and its thickness is 1.7 mm. The face's thickness is 3.5 mm. Item 4/160 also has a blue glass bezel with an engraving of a man's bust. The letters "CA.VI" are on one side, and the letters "RI" are on the other (RMSC Exhibition Condition and Recommendation Reports). Unique among these rings is catalog number 6014/160 in that its face consists of two hands holding a heart. Finally, there are two fragmentary rings: 15051/160, with perhaps a white glass or stone in its bezel, and 201/160 which is made up of two fragments of what was once a ring with a blue glass bezel.

Figure 10. Copper-Alloy British Royal Medal (6125/160) from the Townley-Read Site (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

Medals

A. British Royal Medals

There are seven medals in the Townley-Read collection that can be classified as British Royal medals (see Table 14). Medal 6012/160 is on exhibit at RMSC and could not be closely examined. Only one side of it can be seen and it has a bust of King George I looking to the right. It is a George I Type 1 medal, which Barry C. Kent describes in *Susquehanna's Indians* ([1984] 2001); the reign of King George lasted from 1714-1727 (Kent [1984] 2001:282).

Medals 6125/160 (Figure 10), 6167/160, 6221/160, and 6223/160 are all George I medals (Kent [1984] 2001:282, Type Ib). 6221/160 was found with the chain 6222/160. 6228/160 says "Carolina Regina" on one side and "George" on the other. Both sides have busts, and it is a George II and Queen Caroline medal. King George II's reign lasted from 1727-1760 (Kent [1984] 2001:283-4, Type III). Queen Caroline died in 1737, which means that the medals were most likely created in 1737 or before (Kent [1984] 2001:283), which is helpful in dating the Townley-Read Site.

B. French Jesuit Religious Medals

There are eleven French Jesuit religious medals in the collections. Medal 6008/160 is on display at RMSC, so close inspection of it was not possible. Items 10/160 and 6072/160 are round in shape; 10/160 has a figure with a crown and halo carved into it with the words "SAINCT CLAVTIT." The face is looking to the left on this side, and there is also a staff with three prongs. On the opposite side, there is a figure with a halo and staff with the words "SAINCT CLAIRE." Medal 6072/160 is a metallic color and has a cross with the letters "N,D,M,L," "C,S,M,L," and "C,S,P,E (or P)" on one side and a circle with a flower and the letters "I,H,S" on the other side. Four medals (6025/160, 6070/160, 6287/160) (see Figure 11), and 6292/160 (see Figure 12) are all octagonal in shape. Catalog number 6025/160 has busts on both of its sides, and the letters "ALVATOR" are on the left side of one of the busts. Medal 6070/160 has a bust of a

Figure 11. Copper-Alloy French Jesuit Religious Medals from the Townley-Read Site: a 6287/160; b 6288/160; c 6289/160 (On loan to the Rochester Museum & Science Center courtesy of the Rock Foundation)

Figure 12. Copper-Alloy French Jesuit Religious Medals from the Townley-Read Site: a 6290/160; b 6291/160; c 6292/160 (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

woman on one side with the words "MATER DEI," and on the other side is a bust with letters that cannot be read. Item 6287/160 has a figure of a man on one side holding a staff and the lettering "SAINT IACC...," and on the other side a vague face and the outline of pleated robes. Medal 6292/160 has busts on both sides but one side is more detailed than the other. Medals 6071/160 and 6288-6290/160 (see Figures 11 and 12) are all oval-shaped; 6071/160 has a head and torso of a man on one side with the lettering "FRANCISE XAVE..." and the other side has the head and torso of a man with the lettering "...FVN..."

C. Indeterminate Medals

The following medals may be either British Royal medals or religious medals. Catalog number 6288/160 has a house shape with a clover design in the roof and writing that cannot be deciphered; the other side is badly corroded. Item 6289/160 has the same house shape as 6288/160, and on the other side there is a profile looking to the right. Medal 6290/160 has a bust of a man with a detailed face on one side and a house on the other with the letters "E,L,S." The last of these medals (6291/160) has profiles on both sides and resembles George and Caroline medals (Kent [1984] 2001:282-4).

D. Heavily Corroded Medals

There are four medals in the collection that are difficult to decipher. Items 6026/160 and 6027/160 are both on display at RMSC; each appears to have the figures of two people on the side that can be seen. Medal 6267/160 is broken into eight pieces, with the largest piece (16.4 mm by 22.2 mm and 1.6 mm thick) showing signs of a carving. Medal 6399/160 is round and extremely corroded; it is 38.5 mm in diameter, 37.4 mm tall, and 2.2 mm thick.

Modified Artifacts

The objects in the Townley-Read copper-alloy assemblage which were modified from their original European forms for adornment include beads, bangles, bracelets, necklaces, ornaments/spirals, thimbles, and pendants.

Figure 13. Copper-Alloy Beads from the Townley-Read Site: a-b. 6164/160 (seed beads and bangle); c-d. 6414/160 ("spring beads") (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

Beads

An estimated 566 copper-alloy beads were recorded from the Townley-Read Site. Of this total, 486 are classified as "seed" beads, 74 as spring beads, and 6 as tubular beads. Exact counts could not be made due to time constraints.

A. Seed Beads

"Seed" beads make up the majority of the approximately 566 total beads (see Figure 13a). "Seed" beads have been described "as small globular or round beads and were usually strung on long strings" (Anselmi 2004:187). The "seed" beads from Townley-Read range from about 1.0 mm to 3.0 mm long, 1.5 to 4.2 mm wide, and 0.4 to 1.5 mm thick. There are both round and square shaped examples. The beads appear to have been made from sheet metal that was cut into small pieces. These small strips of metal were then rolled to form the beads' tubular shapes. Where the metal edges were joined, there is a seam down the side of the bead that is more distinguishable in some beads than in others.

Many of the beads are either joined to one another or have material passing through their interiors. Examples of "seed" beads found in attached strands are cataloged as 6074/160 and 6268/160. The first (6074/160) consists of two separate strands, one built of 10 beads and the other of 24. Item 6412/160 has a variety of strands of beads, of which the longest has six beads and the rest vary between four, three, and two beads together. The beads on these strands have no spaces in between each other. Other "seed" beads have undetermined material remnants in their interiors, as in the case of the beads of 6000/209 which are on their original cordage. The strands of beads of catalog number 6412/160 have material strung through them as well. In a more unique case, the "seed" beads of catalog number 6003/209 are found embedded in a fragment of an animal fur blanket and clearly were once attached to it.

The "seed" beads at Townley-Read are similar to those described as "rounded beads" at the Seneca Cameron Site

Figure 14. Copper-Alloy Bangles from the Townley-Read Site (6592/160) (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation)

(circa 1595-1610) (Wray et al. 1991:246, 411 and Anselmi 2004:475). The description of these beads is that they were "rolled from small, oval blanks or pieces of brass" and that there is "very little variability among themselves" (Wray et al. 1991:246). The "seed" beads at Townley-Read resemble the Cameron Site beads, which also are similar to those found at the proceeding Tram Site (c. 1580/1585-1595) (Wray et al. 1991:246, 387 and Anselmi 2004:473).

B. Spring Beads

"Spring" beads are the second most numerous type of bead in the assemblage (see Figure 13c-d). They were most likely formed "from long strips of metal wound longitudinally around some sort of dowel or leather thong" (Ehrhardt 2005:115). The "spring" beads from the Townley-Read Site vary in length (from approximately 1.0 mm to 74.4 mm) and in number of coiled rings. There are remnants of beads with as few as one coil preserved to beads with 35 coiled rings. The diameters of the "spring" beads vary as well (from approximately 1.0 mm to 16.4 mm). The thickness of the metal wire that makes up these beads is consistently between about 0.3 mm to 2.1 mm.

Many of the "spring" beads have material inside of their cores indicating that the beads had once been strung. This is the case for the beads of catalog numbers 64/160 and 65/160 whose inner cores were completely filled with the remnant of this stringing material. Not all of the "spring" beads have perfectly parallel sides. Catalog number 6075/160 has beads bent into U-shapes, and the beads of 6277/160 are shaped in the fashion of a circular necklace. "Spring" beads have been found with other forms of beads as well. In the case of catalog number 6307/160, "spring" beads are mixed with white wampum shell beads and "seed" beads of an unidentified material. Collectively these beads had at one point formed a necklace. Another necklace example is 6702/160 of which seven "spring" beads remain, and while they are of varying lengths, they are consistently about 16.0 mm in diameter. These rings were found in association with brown, fraying cloth and six white "seed" beads.

C. Tubular Beads
The Townley-Read Site did not reveal many examples of "tubular" beads. The tubular beads seem to have been constructed in a manner similar to the "seed" beads (Ehrhardt 2005:110); they appear to have been fashioned from "edge-ground blanks that were rolled tightly and then ground again along the seam until the seam was nearly invisible" (Anselmi 2004:182). Items 15073/160 and 15074/160 are similar in size (15073/160 is 17.2 mm long, 6.7 mm wide, and 0.7 mm thick and 15074/160 is 17.7 mm long, 5.9 mm wide, and 0.6 mm thick). Both have material within their cores, and each was probably a part of a strand of beads. Item 6707/160 is different from the other two beads because its core is filled with glass. The bead is broken up into many pieces, but the seam where the metal was joined to form the bead is apparent. The longest fragment is about 34.5 mm long. The glass within the bead is brownish pink, and there is possibly a textile material covering one of the bead fragments. In the Cornell collection, there is one tubular bead that is about 44.3 mm long and 3.8 mm wide.

Bangles
Bangles are the second largest category of objects in the copper-alloy assemblage (165 pieces total) (see Figure 14 and Table 15). These bangles were "formed by rolling a flat trapezoidal or square shaped blank into a cone with an open apex" (Ehrhardt 2005:120). There are holes at both bases of the cone so that a string material, frequently hair, could be "threaded through the open tip and looped or knotted on the inside" (Ehrhardt 2005:120). Some of the bangles in the Townley-Read assemblage have remnants of this material in their cores. These objects could have been used "as a fringe decoration on clothing or accessories such as bags or purses" and would "dangle freely" yet "contact each other and 'tinkle' with the movement of the user or the wearer" (Ehrhardt 2005:120).

Bangles, also referred to as "tinkling cones" or "slim open cones" (Anselmi 2004:201), are similar to tubular beads in form and apparent manufacture but bangles have a more conical shape. The seams of the bangles in the assemblage differ in style. Some form neat and smooth lines, in others the metal overlaps, and the rest form disconnected gaps. Three of the bangles from catalog number 6002/160 are embedded in fur and the rest of the 44 bangles have fur strung through at least one of their openings as well as a tighter material, possibly leather, running through their narrower openings. The 56 bangles included under catalog number 6175/160 have material strung through their interiors as well. Bangle 6011/160 is a unique example; instead of having material within its core, the bangle is encased in a piece of bark.

Bracelets
The Townley-Read Site has two complete bracelets and three fragments of a third bracelet. Hollow tubing was used in a variety of ways, including the making of bracelets (Anselmi 2004:193). Item 6017/160 is a strip of metal that has been curled to form a "B-shaped pattern" (Anselmi 2004:193). The ends of this metal strip join in an overlap so that the metal forms an elliptical shape. It is 150.0 mm long, and its widest diameter is 53.7 mm and its narrowest is 40.1 mm. The band is 5.3 mm wide.

Bracelet 6654/160 appears to be a C-shaped bracelet (Sempowski and Saunders 2001:118). C-shaped bracelets could be made from strips of sheet metal that are manipulated "into an open bangle or C-shape" (Ehrhardt 2005:127) or from wire, formed by bending a piece of wire into a "C" (Ehrhardt 2005:127). Item 6654/160 is made up of two rows of wire that are joined together at the ends. The wire is a piece of rolled up sheet metal and in the diameter of the wire is unidentifiable material. The bracelet is 55.9 mm long, 37.1 mm in diameter, and the band is 2.2 mm wide. The thickness of the band is 6.2 mm and the wire is 2.7 mm thick. 6655/160 has three pieces of a bracelet, and the wire forming these pieces is similar to that of 6654/160. It also appears that there may have been another piece of wire attached at one point. There is a rusty patch on one point of the wire indicating this possibility. The shapes of the three pieces suggest that 6655/160 may have been C-shaped. The first piece is arced and 41.6 mm wide. The band is 3.8 mm wide and 4.1 mm deep. The second piece is arced as well and 39.2 mm wide. The band is 3.6 mm wide and 3.8 mm deep. The last piece is flat and 16.9 mm long, 4.3 mm wide, and 3.7 mm deep. The wire itself is 1.6 mm thick.

Necklaces
The Townley-Read collection has three remnants of chain-linked necklaces. These chain links are small pieces of copper-alloy metal that had been folded into s-shapes and then joined so that individual links would connect to one another to form the necklace. 6179/160 is broken into many little fragments of links. There are over twenty of these s-shaped links, and they are mainly the same size and shape.

Table 15. Bangle Dimensions

Average Length (mm) (n=161)	17.8
Average Width - narrow end (mm) (n=151)	2.6
Average Width - wider end (mm) (n=163)	5.0
Average Thickness (mm) (n=158)	0.6

Table 16. Necklace Dimensions

	6179/160	6222/160	6224/160
Chain Length (mm)	—	897.0*	475.0*
Width across Links (mm)	2.7	2.4	3.6
Individual Link Length (mm)	6.1	5.2	5.2
Link Wire Thickness (mm)	0.8	0.6	1.2

*estimated number

Only one link remained in good condition (refer to Table 16). 6222/160 is made up of many small links (same shape as 6179/160), and the links are twisted tightly together. The necklace is extremely fragile and was difficult to measure so that no breaking would occur. 6224/160 (Figure 15) is similar to 6222/160 except that the links are more closely spaced and tightly folded together, and the links are also individually longer. Both 6222/160 and 6224/160 (Figure 15) were once attached to royal medals.

Ornaments/Spirals

Spiral shaped copper-alloy metal objects have been found at

Figure 15. Copper-Alloy Necklace from the Townley-Read Site. a.6224/160 (chain); b. ?/160 (medal) (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

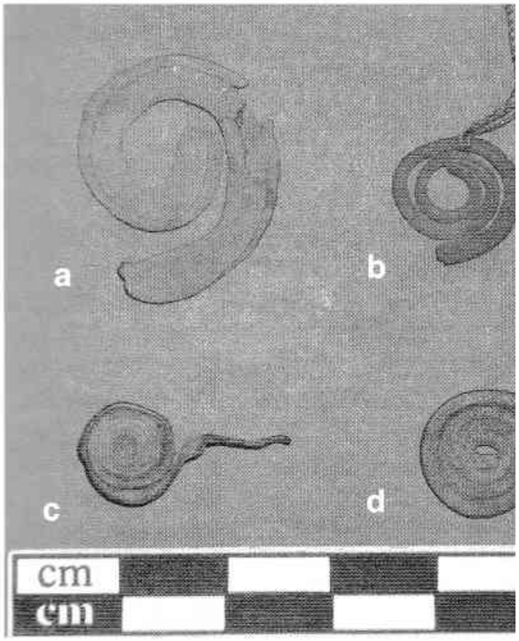

Figure 16. Copper-Alloy Ornaments/Spirals from the Townley-Read Site: a. 6042/160; b. 6043/160; c. 6044/160; d. 6045/160 (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

a number of Seneca sites, including the Adams, Culbertson, Tram, and Cameron Sites (Wray et al. 1987 and 1991). There are five spiral shaped objects from the Townley-Read Site; four at RMSC and one at Cornell University. James W. Bradley and S. Terry Childs state that these pendants are found predominately in sixteenth-century Iroquois sites (1991:7) and are not as common in the seventeenth century (1991:8). The spirals in the Townley-Read collection indicate that these objects remained in use until at least the early eighteenth century.

Anselmi examined spiral ornaments in her study and explains that they are "formed by first creating a long slim tube that was then folded/coiled into the spiral form after a number of annealing events" (Anselmi 2004:215). The general description of spirals is that they were "most often, made from a thin, rectangular strip of metal that had been rolled into a tube, then coiled into a loose spiral" and their "ends were usually tapered" (Bradley and Childs 1991:7). However, three of these objects are flat and the other two are made of a rectangular-shape metal. Bradley and Childs further explain that "hoops" consisted of "a thin, rectangular piece of metal that was first rolled into a tube, then worked into a circle, and finally flattened" (1991:7). A similar procedure may have been used to form the three flat spirals. Bradley and Childs argue that the structures of these objects were designed by Native Americans in such a way to express "meaning and power from traditional native beliefs and cosmology" (1991:16).

Spirals 6042/160, 6043/160, and 6045/160 (Figure 16) are not "tubular" as Anselmi describes, but she also mentions that "some of the spiral forms bear evidence of hammering or flattening upon completion" (Anselmi 2004:215). The average thickness of these three spirals is 0.7 mm and the width of the metal is 2.6 mm. The maximum width is 22.2 mm and the narrowest width is 9.2 mm. 6044/160 and TR589.26 are not flat, but the metal strips that they are made out of are not tubular but rectangular. 6044/160 is tightly wrapped and has 7 layers. The band is 3.4 mm wide and 0.6 mm thick, and the dimensions are 9.2 mm by 10.7 mm. TR589.26 has four coils, and the dimensions are 11.0 mm by 8.9 mm. 6044/160 and TR589.26 are most likely not ornaments or spirals for they do not have the same flat appearance as the others. It is possible that they are parts from larger mechanical mechanisms.

Thimbles

Five brass thimbles were found at the Townley-Read Site, and they are all a part of a necklace that also included six double-perforated red slate pendants (RMSC Exhibition Condition and Recommendation Report). This is an example of a utilitarian European object being used for adornment purposes. This necklace is on display at RMSC so close examination was not possible. The thimbles have a rough texture of tiny raised domes and have rims around their bases. They have flat tops with puncture holes through

Table 17. Townley-Read Manufacturing Debris/Raw Materials

Material	Surface-Collected (RMSC)	Unknown (RMSC)	Burials (RMSC)	Domestic Context (TRNG)	Total
Fragments	20	118*	5	45*	188*
Kettle Ears	2	3			5
Kettle Patches	2				2
Total	24*	121*	5	45*	195*

*estimated number

which a wire (material could not be identified) passes to string the pieces together.

Pendant

The one pendant (6446/160) in the collection matches the description of "discs," which were mainly circularly shaped with perforations and could be "either flat or domed" (Anselmi 2004:219). The object is a flat circular piece of sheet metal with perforations spread throughout it. The pendant may "have been chiseled, scored or cut from raw material and then ground along the edge" (Anselmi 2004:219). The pendant is 26.9 mm in diameter and 0.6 mm thick.

Manufacturing Debris/Raw Materials

Fragments

There are about 188 sheet brass fragments or scrap pieces in the Townley-Read collections (see Table 17). There are several catalog numbers for which it is difficult to determine precise quantities. These fragments come in a variety of shapes and sizes. The scrap metal includes piece 15048/160, which is clearly a part of a kettle since it has a distinct rim of overlapping metal on one side with remnants of an iron bail passing through it. These fragments suggest that there may have been many more kettles at the site that have either been lost or broken up so that the metal could be reworked into new items. Sempowski and Saunders indicate this was true of the earlier Seneca Dutch Hollow Site (1605-1625) by stating that "the presence of isolated kettle lugs and rim fragments… as well as the amount of scrap and partially worked sheet brass on the site suggests that kettles must have been more frequent than it may appear initially" (Sempowski and Saunders 2001:19, 124).

The average width of these pieces is 17.8 mm and the average height is 22.0 mm. There are also four bags of fragments. The average thickness of the fragments is 0.8 mm. The average weight of the fragments is about 4.3 g and the total weight of the fragments is about 303.0 g.

Kettle Ears

There are five fragments of kettle ears in the collection (see Table 18). Fragment 22/160 has two large holes in a horizontal line and one hole directly above them (Brain 1979:figure on p. 165, Type A, number 3). There is a remnant of a bail through the top hole. 33/160 has two holes underneath the rim. 15075/160 (Figure 17) has two holes in a vertical line, and the bottom one is filled with a rivet (Brain 1979:figure on p. 165, Type B, number 1). 15076/160 (Figure 17) is a folded over piece of metal with a rivet through both of the sides. 15077/160 (Figure 17) is folded over as well and has a hole through both sides where a rivet may have once been.

Figure 17. Copper-Alloy Kettle Ears from the Townley-Read Site: a.15075/160; b. 15076/160; c. 10577/160 (On loan to the Rochester Museum & Science Center, courtesy of the Rock Foundation).

Table 18. Kettle Ear Dimensions

Catalog #	Height (mm)	Width (mm)	Thickness (mm)
22/160		-	3.6
33/160	18.1	33.3	1.0
15075/160	34.1	25.7	0.9
15076/160	23.6	29.1	0.7
15077/160	22.3	15.7	0.9

Kettle Patches

There are two kettle patches in the collection. 6578/160 has three layers of metal and has three puncture holes. Two of these holes are filled with rivets, but there appears to have been more rivets connecting the pieces at one point in time. The patch weighs 12.4 g. 6480/160 has many punctures and six are filled with rivets (see Table 19).

Miscellaneous Objects

There are several objects from the Townley-Read collections that do not specifically match the other categories (see Table 20). This includes 6158/160, which is classified as a "tear drop" earring. The earring itself is likely made out of blue glass, but at the top of the tear drop, there is a piece of metal

Table 19. Kettle Patch Dimensions

Catalog #	Height (mm)	Width (mm)	Thickness (mm)
6480/160	39.1	84.8	1.3
6578/160	33.9 (max.)	43.6 (max)	0.9 (avg.)

Table 20. Miscellaneous Object Dimensions

Catalog #	Height (mm)	Width (mm)	Thickness (mm)
21/160	42.4	12.7	2.9
6313/160a	15.3		1.3
6313/160b	28.6		1.3
TR531.7	25.3	3.4	
TR806.1	24.5*	4.0*	3.0*
TR914.3	37.8	2.6	2.6

*estimated number

wire that could be copper-alloy. This piece of wire is 1.0 mm thick. There is also a piece, 21/160, that could be the trigger guard of a gun. Item 6313/160 is comprised of two hooks that are attached to one another (6313/160a is fragmented; 6313/160b is not). There is a black glass bead on 6313/160b. In the Cornell collection, TR531.7, is a piece of rolled up copper-alloy metal but does not appear to be a tubular bead. TR914.3 is a long, thin, twisted piece of copper-alloy metal. TR806.1 is an unidentifiable object and is folded over metal.

Discussion of British and French Copper-Alloy Artifacts at the Townley-Read Site

The Seneca peoples interacted with both the British and French over the course of the contact period due to trade relations and also warfare (Jordan 2008:49-57; 2002:80-91). Conflict arose between the French and the British, and "conflict between the Iroquois and western nations immediately became entangled with the French-English rivalry" (Jordan 2008:51; 2002:84). The French led a number of invasions into Iroquois territory and destroyed Seneca villages in 1687 (Jordan 2008:51-4; 2002:34-5). It is believed "that some eighteenth-century Seneca villages were more 'pro-French' and others more 'pro-English,'" especially exhibited during the Seven Years' War (Jordan 2008:28; 2002:146). Townley-Read was inhabited between the years of 1715 and 1754 (Jordan 2008:1, 154-162; 2002:287-91) during which time the Seneca peoples experienced a "middleman period (1713-1724)" where both the French and the British utilized "diplomatic presents and services" (Jordan 2008:91; 2002:139). The French Jesuits mainly were present in the seventeenth century, but there was a Jesuit mission present among the Senecas during the early eighteenth century and Jesuits may have been in Seneca territory until as late as 1713 (Jordan 2008:36; 2002:75). Based upon all of these possible opportunities for interaction with the French and British powers, it is to be expected that Townley-Read would contain material signs of contact with these two European groups. However, there appear to be more French-made than British-made objects in Townley-Read's copper-alloy assemblage.

The Jesuit crucifixes, rings, and medals are the most significant examples of French interaction with the Seneca peoples. James W. Bradley writes that "medals, crucifixes, and finger rings" were "Catholic religious ornaments" and "markers of a French presence" (Bradley [1987] 2005:136). These objects were given to Native Americans with the intent of encouraging conversion to Christianity (Bradley [1987] 2005:136). They were especially given to Native American children, who the Jesuits found to be easier to convert than adults, and in the records of the Jesuits, "references are made which indicate crucifixes and medallions were given to American Indian youths as rewards..." (Rinehart 1990:9). The kettles provide another indicator of French interaction. Jeffrey P. Brain explains that the kettles found at the Tunica Site were common forms of kettles during the eighteenth century in France and England (Brain 1979:164). He further describes that Type A, Variety 1 kettles (the type of two kettles in the Townley-Read assemblage) were often found during the eighteenth century in France, and he explains that this kettle form can be found in paintings of that era (Brain 1979:166). This signifies that the kettles present at the site may have been a result of Seneca-French trade relations at one point in time. The bells present at the site can fall into either category since "the Spanish, French, and English all traded, or gave, bells to the Indians during their long periods of colonial activity" (Brain 1979:197).

Indications of British interaction with the Seneca people of Townley-Read are mainly the British royal medals and the braid/cloth that may have been part of military dress. There are seven medals in the assemblage with engravings of British monarchs. Five of these medals are King George I medals in honor of the King that ruled from 1714-1727 and have the bust of King George I on them (Kent [1984] 2001:282). At least one of the remaining two medals is a King George II medal, who reigned from 1727-1760 (Kent [1984] 2001:283). They include the busts of both King George II and his wife Queen Caroline. The braid/cloth may have been used as "strips of metallic braid, or galloon," which was used, as previously mentioned, in the eighteenth century to decorate clothing and is also useful in dating the site (Brain 1988:412, Appendix F). There is description of galloon being a part of British military dress (Carman

Table 21. Site Distribution: Adornment Materials

Material		Surface-Collected (RMSC)	Unknown (RMSC)	Burials (RMSC)	Domestic Context (TRNG)	Total
Bangles		5	50	109	1	165
Bead Style	*Seed*		57*	429*		486*
	Spring	2		72*		74*
	Tubular	1	2	2	1	6
Bells			2	18		20
Bracelets				3		3
Braid/Cloth			2*	3*		5*
Buckles			1	1		3
Buttons			12	3		15
Crucifixes		2				2
Medals		4		16		22
Necklaces				3		3
Orn./Spirals			4			5
Pendant		1				1
Rings		4	4	56	1	65
Thimbles			5			5
Total		**20**	**141***	**715***	**4**	**880***
Percent of Total		**2.3%**	**16.0%**	**81.3%**	**0.5%**	**~100.0%**

*estimated number

1957:40-2), which could indicate the presence of British forces at the Townley-Read Site or that the exchange of goods between the Seneca people and the British brought military clothing to Townley-Read.

Distribution of Copper-Alloy Assemblage at the Townley-Read Site

Anselmi explains that "among the Seneca, European-introduced metal materials were ritually significant, in that they were overwhelmingly included in burials at Early Contact period sites such as Adams, Culbertson, Tram, and Cameron" (Anselmi 2004:412). The majority of the copper-alloy assemblage from Townley-Read was found in mortuary contexts and very few were recovered from domestic contexts. More utilitarian objects were found in domestic contexts than adornment objects. Of the approximately 880 adornment items (Table 21), about 81.3% of them were excavated from burials and less than 1.0% of the artifacts were for certain located in domestic contexts. The remaining percentages include 16.0% of the adornment items found in unknown locations and 2.3 % from surface contexts. Of the approximately 56 utilitarian objects in the assemblage (Table 22), 10.7% were recovered from burials and 7.1% from domestic contexts. The remaining percentages include 76.8% of the utilitarian items found in unknown locations and 5.4% from surface contexts. The distribution of utilitarian copper-alloy materials seems to be a bit more evenly distributed between burial and domestic contexts than that of the adornment pieces. The majority of the manufacturing debris and raw materials (62.1%) come from unknown contexts (Table 23).

Anselmi found that the kettles she examined were "primarily recovered from burial contexts" (Anselmi 2004:270). It has been found that as trade between Europeans and Native Americans progressed, "unaltered kettles were more frequently found in mortuary contexts rather than in domestic ones, serving as containers for human bones or funerary offerings like beads or foods" (Ehrhardt 2005:74). Others believe that a kettle was thought to have a "soul" in some Native American practices so that "kettles were deposited intact in graves…so that their 'spirits' could accompany the deceased to the 'other world'" (Ehrhardt 2005:74).

Out of the approximately 566 beads, 503 were recovered from mortuary contexts. It is possible that during the occupation of the site there had been more beads in domestic contexts, but based upon this evidence, it seems that beads were of significance to burials at Townley-Read. The majority of the bangles and bells and all of the bracelets and

Table 22. Site Distribution: Utilitarian Materials

Material	Surface-Collected (RMSC)	Unknown (RMSC)	Burials (RMSC)	Domestic Context (TRNG)	Total
Awl	1				1
Fishhook	1	1			2
Handle		1			1
Kettles		1	3		4
Mouth Harps	1	2	2		6
Pins		30*			30*
Pipe		1			1
Projectile Points		6		3	9
Spoons		1	1		2
Total	3	43*	6	4	56*
Percent of Total	5.4%	76.8%	10.7%	7.1%	~100.0%

*estimated number

Table 23. Site Distribution: Manufacturing Debris/Raw Materials

Material	Surface-Collected (RMSC)	Unknown (RMSC)	Burials (RMSC)	Domestic Context (TRNG)	Total
Fragments	20	118*	5	45*	188*
Kettle Ears	2	3			5
Kettle Patches	2				2
Total	24*	121*	5	45*	195*
Percent of Total	12.3%	62.1%	2.6%	23.1%	~100.0%

*estimated number

necklaces were recovered from burials. Almost all of the rings and medals were excavated from burials as well. The only adornment objects not excavated primarily from graves are the buttons, the ornaments/spirals, and the single pendant.

Townley-Read Site Copper-Alloy Assemblage and Its Continuity with Earlier Periods

The study of Onondaga Iroquois sites conducted by Bradley indicates that throughout the early seventeenth century there was an emphasis on copper-alloy material being reworked for ornamental purposes (Bradley [1987] 2005:132-5). The ornaments found at Onondaga sites at this time (such as tubular beads and pendants) are similar to the items at Townley-Read (Bradley [1987] 2005:133). While these items were still made, Bradley explains that more European items appear in the later seventeenth century in their original forms (Bradley [1987] 2005:134). The Townley-Read copper-alloy assemblage encompasses this trend, but Bradley's claim that historic period sites have more pieces in their original European forms than in the various reworked forms (Bradley [1987] 2005:135) is not the case at Townley-Read.

The artifacts in the Townley-Read copper-alloy assemblage closely resemble copper-alloy assemblages at later seventeenth-century Seneca sites. The copper-alloy artifacts found at the Ganondagan Site (1670/1675 -1687), as described by Anselmi, are similar to those found at Townley-Read (Anselmi 2004:495-9). The Ganondagan collection contains buckles, bells, kettles, kettle fragments, mouth harps, seed beads, bangles, pendants, Jesuit rings and medals, a spiral, and a handle (Anselmi 2004: 494-495), all of which are found at Townley-Read. There are some differences such as the presence of fishhooks at Townley-Read but not at Ganondagan and the presence of coins only at

Ganondagan. However, overall, the two sites' assemblages have a great deal of overlap (Anselmi 2004:495-9), suggesting stability in the use of copper-alloy artifacts at Seneca sites from the 1670s throughout the first half of the eighteenth century.

Continuity of copper-alloy artifact use is exhibited in the pendant at Townley-Read, for according to Charles F. Wray these "were used from 1550 to the late 1600s" (Wray 1973:23). Wray also states that bangles could be found at sites from 1550 until the end of the American Revolution (Wray 1973:23), and there are 165 bangles in the Townley-Read collection. Wray found that seed beads and necklaces made out of copper-alloy links are present in the eighteenth century as well, and that projectile points and buttons are common at sites around 1640 (Wray 1973:23). All of these items (seed beads, necklaces, projectile points, and buttons) are in the Townley-Read assemblage. Overall, there does not appear to be a radical change in the contents of the copper-alloy assemblage at Townley-Read when compared to the copper-alloy assemblages of seventeenth-century Seneca sites.

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Salvaged Site Data Confirms the Middle Woodland Period Abbott Complex in Coastal New York

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To substantiate evidence of a newly recognized Middle Woodland period culture entity in western coastal New York, the uniqueness of the cultural material elements that define the entity had to be distinguishable from those of the indigenous Windsor Culture. Material attributes diagnostic of the Abbott Complex, such as the Cony Lanceolate and Cony Stemmed projectile points, Cony Knife and contextually recovered Abbott Zone decorated ceramic ware, set this assemblage apart technologically and stylistically from all other recognized coastal New York contemporary culture material assemblages having a similar function. The genesis, and temporal placement of the Cony projectile point type and its speculated morphological similarity to the Ohio Steubenville projectile point was debated and found to have no typological or temporal relationship to the Ohio Steubenville bifaces. As an adjunct to this research, relevant data extracted from additional sites would be the basic criteria to be met as a means of establishing in high probability, the local and regional temporal sequence of the Abbott Complex occupation and its coincidental association with the indigenous coastal New York, Windsor Complex. To justify the case for an Abbott complex in coastal New York, defined by Abbott Zone decorated ceramics. Cony projectile points and newly discovered trait elements that share in the cultural assemblage, it was imperative that all known sites of Woodland period occupancy be surveyed

Introduction

Nearly a half century of personal surface-collected and excavation data verifies the exploitation of the Bronx County, Pelham Bay Park areas resources by hunter and gatherer groups, ranging in time from the Early Archaic to the Late Woodland, Historic period, assessed at an estimated, 4000 years duration. Included in the Pelham Bay Park archaeological survey were 14 sites that had been nearly obliterated by vandalism, soil erosion damage and modern construction along the parks 13 mi of salt water shoreline. Although disturbed stratigraphically, most sites retained surviving portions of the parent middens containing salvageable cultural remains. Reckless stewardship of the park area's natural environment, shows indifference to the irreplaceable natural resources and protection of the buried evidence of prehistoric buried Native American occupation.

Two of the largest recreation related modifications to the park occurred in the mid 1930s when the Pelham and Split Rock golf courses were opened to the public. The construction of Orchard Beach in 1937 followed, inundating several known prehistoric shell middens on the shoreline with 850,000 cubic yards of brown sand topped with 350,000 cubic yards of white sand. The adjoining parking lot was built on 2.5 million cubic yards of ash and 600,000 cubic yards of sand and gravel fill. To stabilize it from underground stream wash and other earth movements, barges were sunk into the landfill. This single operation, utilizing nearly 4 million cubic yards of fill, created a mile-long lagoon that held surface evidence of prehistoric shell-fish collecting stations along the shoreline (Kaeser 2004a: 51-64). The lagoon archaeological sites were inundated by dredged mud discharge and rock islet blasting debris in preparation for the 1964 Olympic rowing trials. It is not known if this raceway has been used since the trials.

Built within the park's 2,700 acres, were rest room facilities, restaurants, mounted police station and stable, sports stadium, swimming pool, running tracks, ball fields, access roads construction, golf ball driving range, police department shooting range, and explosive disposal area. Possibly the most destructive modification to the park landscape, both in terms of aesthetics and of environment health, was the 1963 construction of a sanitary land fill. Several stories in height and covering acres of Eastchester Bay waterfront, the foul refuse intruded into the water of the Bay. Tide carried and wind blown trash now litters the opposite shore. The combined modifications destroyed not only surviving remnants of the virgin forest and its unique ecosystem, but also physical evidence of the area's prehistoric and early colonial occupation The only redeeming element of the large scale destruction was the vast number of men that were employed to do the work during the years of the Great Depression.

Decades before the Pelham Bay Park recreational facilities were planned and created, Native American artifact collections were made in the rural northeast corner of Bronx County by American Museum of Natural History personnel.

At the time, it is evident that museums were unmindful of the value of recording provenance data. Only sparse field excavation notes accompanied the museum-curated artifacts. When artifacts were displayed, the name of the contributor, if placed next to an exceptionally fine artifact, became a mark of esteem and actually encouraged others to engage in pot hunting. The disarray of cultural materials observed in the study collections is thought to be the fault of either custodial mishandling or unregulated access to the collections.

Inexpensive, published museum monographs provided exciting reading for the novice historian, but little academic value for the concerned student. Possibly the only means of preventing site vandalism, was to provide less than careful descriptions of the methods of excavation and to disclose sketchy map references to the site locations. Published cultural material interpretations of artifact recoveries were often fanciful inventions rather than fact (Kaeser 2004a: 51-64), particularly when describing human burial features and their associated grave goods. This practice of incomplete data recording led to a general acceptance of crude excavation methods, cultural material interpretation and site reporting as the norm by some archaeologists, which, by today's standards, would be considered unacceptable in the discipline.

Collection of Data and Discussion

To broaden the scope of the survey, and to evaluate data already collected, museum collections were examined and searched for cultural materials contextually related to my proposed Abbott Complex. The most extensive and locally available coastal New York collection was examined through the courtesy of the Museum of the American Indian, Heye Foundation, now housed at the National Museum of the American Indian in Washington, D.C. A total of 246

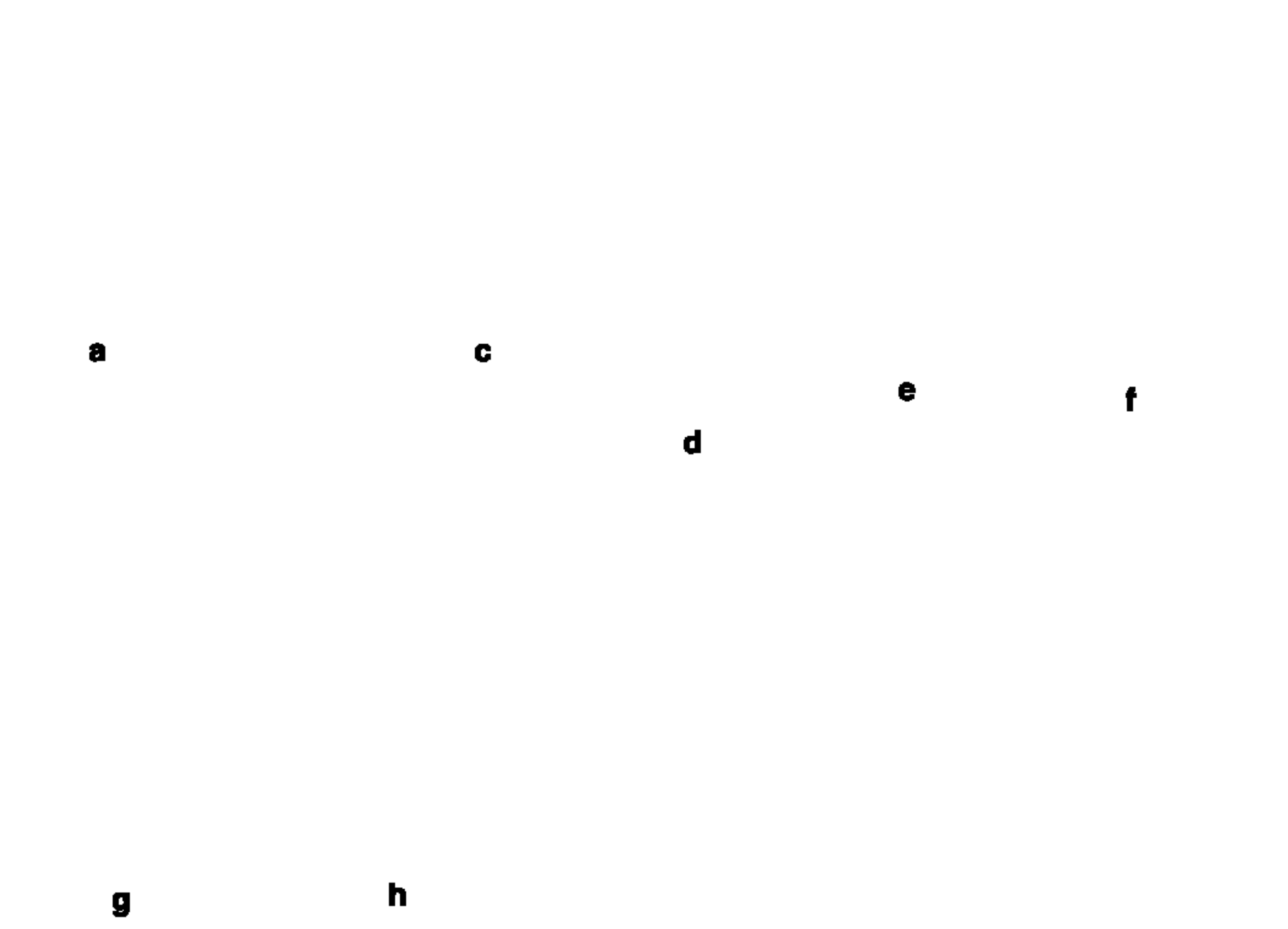

Figure 1. Specimens of Cony Stemmed projectile points (courtesy of the Museum of the American Indian, Heye Foundation, coastal New York collection a-c Canarsie, Kings County; d, e, Mariners Harbor, Richmond County; f-i Tottenville, Richmond County; j tip of blade modified to end scraper; a-f, i, j purple argillite, g yellow-brown jasper, h, grey chert.

lanceolate and 94 stemmed, previously-typed "Steubenville," Cony projectile points (Kaeser 1968a:26) were found in the coastal New York collection of more than 8,000 projectile points (Figures 1, 2). With this sample of 340 cataloged Cony points, it was possible to confirm the geographical occurrence of the points and determine their spatial distribution, as well as variations in projectile point morphology and lithic preferences of manufacture. Although numerous coastal New York potsherd recoveries were examined in the collection, only a few finger-nail sized specimens of Abbott ceramic ware could be found. It is possible that selective collecting took place in the field by museum personnel, favoring less decorated sherds. It is also quite possible that decorated sherds which illustrated the artistic ingenuity of the ancient potters were removed from the study collection and placed on display in the museum cases. An additional reason for the absence of Abbott zone decorated sherds in the study collection might be due to the retention of decorated artifacts by collectors who kept them to enhance their own personal collections.

It was hoped that inferences yielded from this survey would either prove or refute what was then considered theory (Kaeser 1968a: 8-26; 1972: 11-15). Bolstered by the interpretation of archaeological and collection survey data, and a compilation of cultural traits identifiable as Abbott cultural diagnostics, I viewed the results of the survey as an indication of the Middle Woodland period time interval encompassed by the Abbott Complex in coastal New York and the artifacts as diagnostic material elements that identify the Abbott Complex as a distinct cultural entity.

Using theoretical data collected as a baseline for comparison (Kaeser 1963:13-20; 1972:11-15; 1974:1-29; 2004b:53-60), the scope of the research developed incrementally with data collected at 11 published Windsor and East River Complex archaeological sites. In total, 27 sites were included in the survey. The locations of 25 excavated

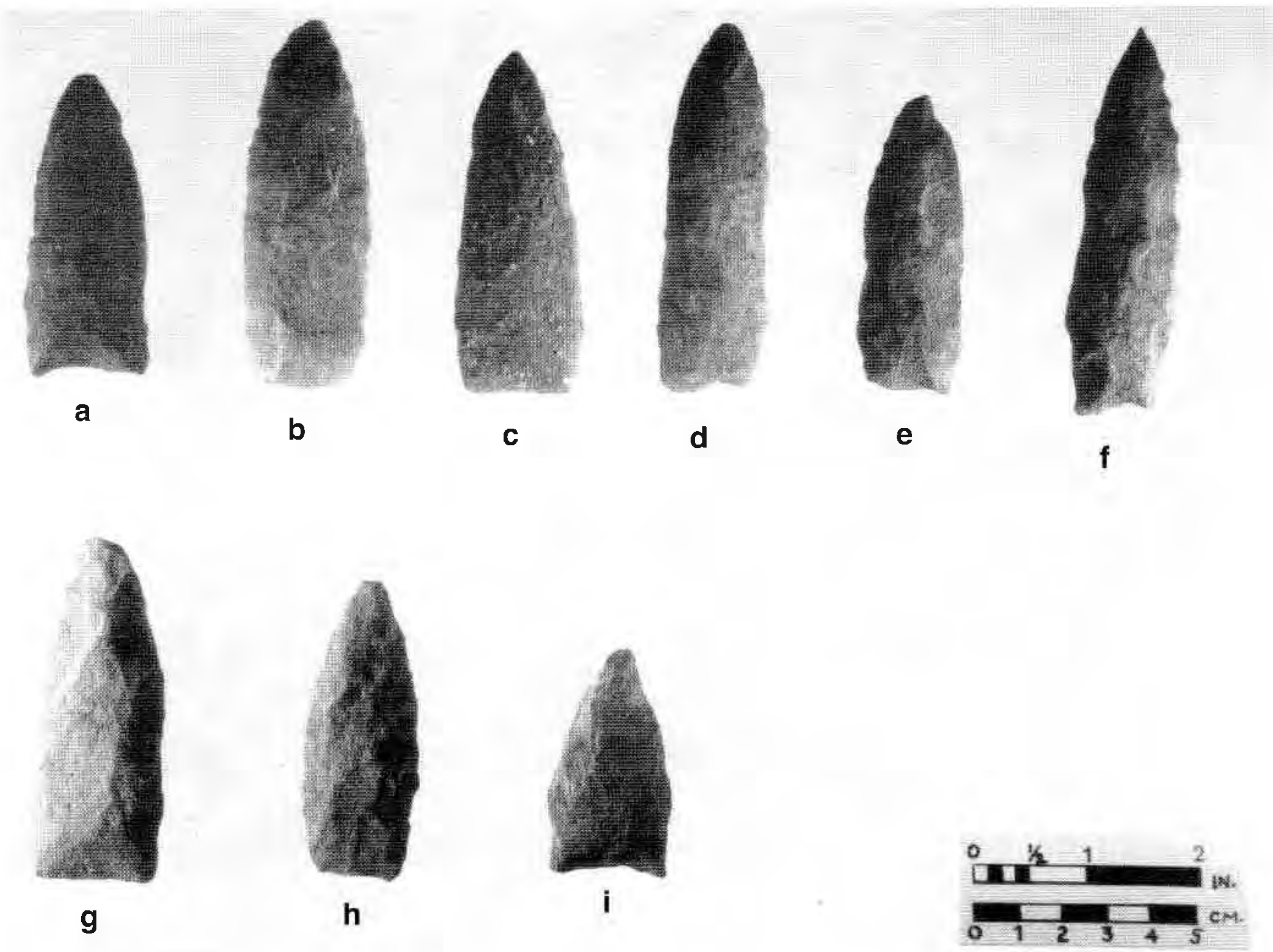

Figure 2. Specimens of Cony Lanceolate projectile points (courtesy of the Museum of the American Indian, Heye Foundation, coastal New York collection: a, b, Canarsie, Kings County; c-i, Tottenville, Richmond County: a-e, purple argillite; f, green-grey argillite; g-i, purple argillite.

Figure 3. Map locations of tested, salvaged and documented sites in Pelham Bay Park, Bronx County, New York. Mount Vernon Quadrangle, New York. 7.5 Minute Series, Topographic. See Table 1 for site names (Sites 26 and 27 -outside map area).

sites are plotted on the Pelham Bay Park Map (Figure 3). Eight salvaged sites contained diagnostics of the Windsor Complex; 12 salvaged sites contained component elements of the East River Complex; 5 salvaged sites contained mixed Windsor and Abbott Complex ceramic diagnostics plus Cony projectile points (Figure 4: a-g) and tools adapted from broken Cony points (Figure 4: k-n). Included in the survey were relevant data from the Morris Estate Club Site, Bronx

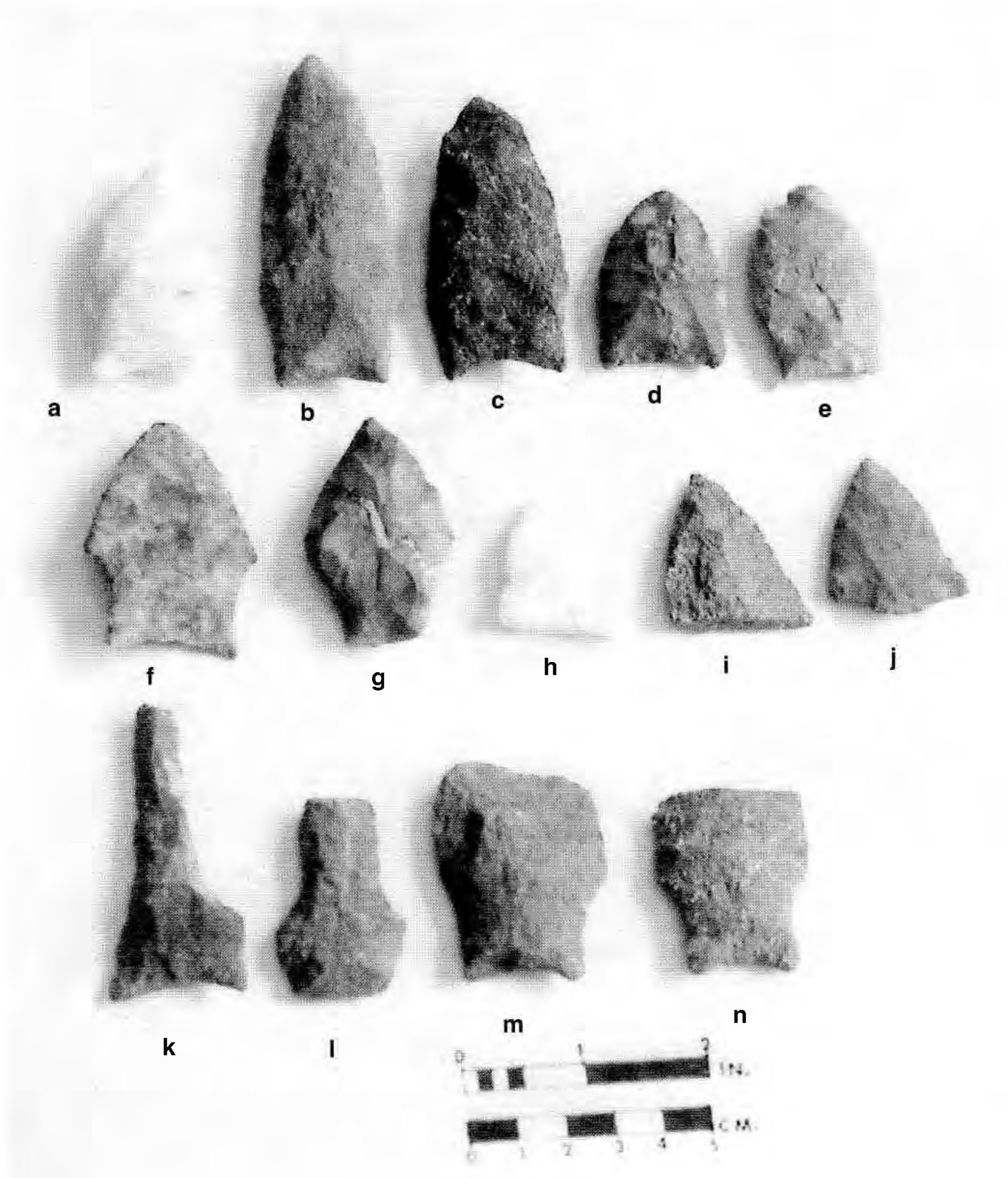

Figure 4. Abbott Complex, Cony projectile points and tools recovered from salvaged sites: a-e. Cony lanceolate points; f, g. Cony stemmed points; h-j. Cony point tips; k, l. hafted drills made from broken Cony points; m. hafted scraper made from broken Cony point; n. basal section of Cony point. a, h. white quartz; b, c, e, i-n. argillite; d, f. chert; g. jasper.

Figure 5. Abbott Complex diagnostics: a. Cony lanceolate point; b. Cony stemmed point, both made of argillite; c. Abbott Zone Dentate bodysherd, muscovite mica tempered

County N.Y. (Kaeser 1963:13-20) and the Oakland Lake Site, Queens County, N.Y. (Kaeser 1974: 1-29; plate 2, 1-4, 6-8). Both of these sites contained stratigraphically recovered diagnostics reflecting the Windsor and Abbott Complex.

It is unfortunate that no formal site report was produced to describe and inventory the multi-component data recovered from the 1950s excavation of the Pelham Boulder Site, Pelham Bay Park, Bronx County, New York. This site was the first site dug stratigraphically in coastal New York. The site excavation revealed a sequential cultural occupation ranging from the Late Archaic to the Late Woodland period. The ceramic and lithic collection is presently curated at the Garvies Point Museum, Sea Cliff, Suffolk County, New York.

Having participated in the Pelham Boulder Site excavation for several years, and therefore having a recollection of the recovery and field recording of thousands of potsherds, hundreds of projectile points and miscellaneous lithic and bone tools, I can affirm the recovery of cultural elements representative of the Middle Archaic to the Late Woodland periods of occupations on the site. Notably recognized as aberrant in the Middle Woodland period Windsor and Late Woodland period East River cultural materials collection were zone decorated potsherds, and unusually large, stemmed and lanceolate projectile points made of exotic argillite. It was at this site, during the late 1950s, that I became involved in an effort to discover and attempt to produce an affirmable, cultural and temporal designation for the odd ceramic and lithic artifact assemblage currently named by me as the Abbott Complex, characterized as Abbott Zone decorated ceramic ware and Cony Lanceolate and Cony Stemmed projectile points.

Informal discussions proposed a trait diffusion or migratory hypothesis to explain the occurrence of distinctive zone decorated ceramic vessel series in western coastal New York which showed no resemblance to the indigenous Windsor Complex North Beach or Clearview phase ceramic tradition (Kaeser 1964: Figure 1). Equally aberrant, the stemmed and lanceolate projectile points made predominately of exotic purple argillite, were stratigraphically intermixed with the indigenous Windsor ceramics (Figure 5: a, b) (Kaeser 2004b: Figure 1a,1b).

During the 1950s, to late 1960s, the stemmed point

Table 1. Survey results of published and salvaged sites tested in Bronx and Queens County, New York (see Figure 3 for site locations).

Site No. or Site Name	Culture and Diagnostics Recovered	Temporal Period
1	Windsor Complex ceramics	Middle Woodland
2	East River Complex, ceramics	Late Woodland
3	East River Complex, ceramics	Late Woodland
4	East River Complex, ceramics	Late Woodland
5** Archery Range Site	East River Complex, ceramics + lithics	Late Woodland
6	Windsor Complex, ceramics + Cony East River Complex, ceramics	Middle Woodland Late Woodland
7	East River Complex, ceramica	Late Woodland
8** Cherry Orchard Rock Site	East River Complex, ceramics + lithics	Late Woodland
9	East River Complex, ceramics	Late Woodland
10	East River Complex, ceramics	Late Woodland
11	East River Complex, ceramics	Late Woodland
12** Bartow Lagoon Site	East River Complex, ceramics + lithics	Late Woodland
13 Milo Rock Site	East River Complex, ceramics + lithics	Late Woodland
14** Pelham Boulder Site	Late Archaic lithics, Windsor, East River ceramics, lithics, Cony	Archaic, Middle - Late Woodland
15 Pot Holed Knoll Site	Windsor Complex, ceramics	Middle Woodland
16	East River Complex, ceramics	Late Woodland
17 **Kaeser Site	Windsor Complex, ceramics, lithics, +Cony	Middle Woodland
18	Windsor Complex, ceramics + Cony	Middle Woodland
19	Windsor Complex, ceramics + Cony East River Complex, ceramics	Middle Woodland Late Woodland
20	Windsor Complex, ceramics	Middle Woodland
21	Windsor Complex, ceramics	Middle woodland
22 **City Island Bridge Site	Windsor Complex, lithics	Middle Woodland
23	Windsor Complex, ceramics East River Complex, ceramics	Middle Woodland Late Woodland
24	Windsor Complex, ceramics + Cony	Middle Woodland
25 **Bird Rock Site	Abbott Complex, Ceramics + Cony	Middle Woodland
26 Morris Estate Club Site	Windsor Complex, ceramics + Cony	Middle Woodland
27** Oakland Lake Site	Late Archaic, lithics Windsor Complex, Ceramics + Cony East River Complex, ceramics, lithics	Archaic Early-MiddleWoodland Late Woodland

**Archaeological Collections Curated in Museums
Site 5 Archery Range; Partial collection, American Museum of Natural History, New York, NY.
Site 8 Cherry Orchard Rock; New York State Museum, Albany, NY.
Site 12 Bartow Lagoon; New York State Museum, Albany, NY.
Site 14 Pelham Boulder; Garvies Point Museum, Suffolk County, NY.
Site 17 Kaeser; New York State Museum, Albany NY.
Site 22 City Island Bridge; New York State Museum, Albany NY.
Site 25 Bird Rock; New York State Museum, Albany NY.
Site 27 Oakland Lake; Garvies Point Museum, Suffolk County, NY.

All salvage site cultural materials, New York State Museum, Albany NY.

described above, somewhat resembling Ohio Steubenvilles, was expeditiously, labeled "Steubenville-like" and "Steubenville" (Ritchie 1969: 105, 106, 111, 183, 184, 210, 227, 230, 199, 200, 202). At the 1966 Eastern States Archaeological Federation meeting, the late Don Dragoo, Curator, Section of Man, Carnegie Museum, who was a respected authority in projectile point typological identification and thoroughly acquainted with the morphological characteristics and areal distribution of the Ohio Steubenville point type, rejected the coastal New York specimens that I and others exhibited at the meeting, as "Steubenville," or "Steubenville-like." This exclusion, was conclusive enough to motivate my efforts to search for evidence to determine the source of the aberrant "Steubenville-like" points and contextually associated Abbott-like ceramic vessel assemblage, and possibly a reason for their transmigration into the coastal New York area.

Ideally, such diffusion or migratory propositions should be supported theoretically and viewed as indicative rather than inferential. Since no suitable interpretive theory had been raised elsewhere to help explain the phenomenon of a significant Windsor and Abbott culture material mix in coastal New York that would help to confirm either of the propositions, I had to contribute the following remarks.

Ordinarily, when typologically similar cultural materials are consistently recovered at several sites and are clustered within an apparently homogeneous shell midden stratum, they are thought to be related elements of a cultural continuum. However, when both the indigenous Windsor tradition ceramics, aberrant Abbott-like ware and "Steubenville-like" points were discovered within seemingly homogeneous shell midden strata at 7 of the 27 sites surveyed, this hypothetical rule appeared to be upset. Theoretically, the evidence might support an interpretation indicating a transitional phase whereby the indigenous Windsor culture either adopted or copied select foreign made ceramic or lithic elements into their material culture. More likely, the archaeological evidence might suggest the sharing of favored trait elements diagnostic of the Windsor and Abbott cultures while in co-habitation of the coastal New York areas shellfish gathering sites.

Resolving questions of the hypothetical possibility of the Middle Woodland period co-existence of Windsor and Abbott cultures in coastal New York required the determination of the temporal limits of the two cultural occupations and the diagnostic materials embodied in their cultural material assemblages that would mark each as a separate entity. This effort was achieved through archaeological evidence that delineated the uniqueness of each distinct cultural material assemblage and revealed evidence of the Windsor and Abbott groups' co-existence at shellfish collecting sites (Tables 1 and 2). The recovery of a non-locally developed pottery series resembling New Jersey Abbott Zone decorated ware (Cross 1956: 144-151; Fig. 7: 4-7; Fig. 8: 10) (Kaeser 1974: 27, Plate 3: 1-5), (Kaeser 2004b: 53-60: Figure 2, 3) firmly illustrates the dissimilarities of the Windsor (Smith 1950, 193- 197; Plate 8) and Abbott Zone decorated ceramic vessel traditions. In the coastal New York area, there is a total absence of archaeological evidence, suggesting a blending of the Windsor and Abbott ceramic traditions in vessel style or decorative motif. Consequently, where Windsor and Abbott vessel styles are recognized, the pottery takes a prominent place in ceramic classification and cultural definition.

Because of small potsherd size, surface delamination, friable paste and surface fire clouding, the absolute typological identification of every sherd specimen is nearly impossible to determine. The preliminary gross defining typological traits were distinguished by observing surface treatment, average sherd thickness and temper material type and size. The most defining typological traits were collar configura-

Figure 6. Coastal New York, potsherd specimens. Transitional Late Archaic to Early Woodland period: Vinette 1. a. exterior surface vertical cord-marked; b. interior surface horizontal cord-marked.

Figure 7. Coastal New York potsherd specimens, Middle Woodland period, Windsor Ceramic Tradition North Beach phase: a North Beach Brushed cup rim and wall fragment; b. North Beach Net Marked, drilled for repair

tions, either true or incipient, near rim or collar decoration treatments and motifs (Kaeser 1964: 1- 8).

Windsor Ceramic Tradition

The Early to Middle Woodland period Windsor ceramic tradition in western coastal New York, is identified by coil constructed, thick walled, collarless, course grit tempered, pointed bottom vessels. At times, the coarse, poorly consolidated grit temper inclusions in the clay mix protrude through the vessel surfaces causing variability in vessel strength. Surface exfoliation resulting from inaccurate clay to temper ratio makes it difficult to surface identify these sherds typologically. Surface fire clouding and unevenness of sherd cross-section color hinders the match up at times of larger vessel body fragments. The non-uniformity of sherd color is primarily due to fluctuations in uncontrolled firing in a bonfire or domestic hearth.

Figure 8. Coastal New York, Middle Woodland period, Clearview phase sherd specimens: a Windsor Cord-Marked; b. Clearview Stamped

Undecorated, the exterior and interior surface treatments of Windsor ware shows haphazard brushing, bunched net impressions, scraping, rare cord-wrapped stick stamping, or overall cord-wrapped paddle impressions. All of the roughened vessel surfaces result from the welding together of the construction coils. Collarless, with a hornet nest-like pointed bottom, the vessel walls range from $^{5}/_{16}$ to $^{3}/_{8}$ in thickness.

Typologically defined by the exterior surfaces horizontal and interior surfaces' vertical cord-wrapped paddle malliation, the vessel type is known as Vinette 1 (Figure 6: a, b), temporally defined as one of the earliest ceramic types manufactured during the transitional Late Archaic to Early Woodland period in the northeast (Ritchie 1965:192,193). In the area under study, Vinette 1 sherds accompany fragments of steatite bowls and transitional Late Archaic to Early Woodland period projectile points such as Orient Fishtail, Perkiomen Broadpoints and Snook Kill points. A more refined version of Vinette 1, locally referred to as Modified Vinette, lacks complete interior horizontal cord-marking, but retains the distinguishing Vinette 1 typological attributes. In coastal New York, this ware has appeared in context with

Early Middle Woodland period Windsor North Beach phase, North Beach Brushed (Figure 7: a) and North Beach Net-Marked vessels (Figure 7: b). Clearview phase vessel types, Windsor Cord Marked (Figure 8: a), and Clearview Stamped (Figure 8: b), are thought to be three of the Windsor Complex, Late Middle Woodland period ceramic types found in western coastal New York (Kaeser 1968b:14 -16).

Abbott Zone Ceramic Tradition

Abbott Zone decorated ware is technologically and aesthetically superior in quality of manufacture and decoration as compared to Windsor tradition ceramics. While I am not aware of a complete Abbott Zone decorated vessel recovery in western coastal New York, enough definable potsherds have been recovered to typologically identify the vessel types and posit their place in the Abbott ceramic vessel tradition.

Probably paddle and anvil manufactured, the vessels have round bottoms, finely incised rim lips, wall thickness averaging 1/4 in, fine to medium ground grit, and either muscovite mica or shell temper. Exotic in coastal New York, muscovite mica is a common temper constituent used in the type Abbott Zone Dentate type. It is a trait useful in the identification of the vessel type and its southern origin. Smoothed, exterior vessel shoulders and near rim surfaces are decorated with carefully executed dentate and incised or bunched net impressions enclosed within plats (Figure 5: c).

Of special note, shell temper appears to be a relatively minor ceramic aplastic in Woodland period pottery making phases in western coastal New York. By contrast, shell temper is a favored constituent in the paste of select Abbott pottery types collected at the Abbott Farm Site in New Jersey. Typologically similar wares are recorded archaeologically within western coastal New York. If Abbott ware was imported into the coastal New York area by trade, or introduced through migration by the vessel makers, it was not supplied in sufficient quantities to give the appearance of local manufacture.

East River Ceramic Tradition

The East River Ceramic Tradition illustrates the Late Woodland period evolution of vessel development by surface finishes and decorative techniques. The earliest phase Bowmans Brook vessel bodies are usually pointed bottom, collarless and medium grit tempered. Cord-wrapped stick stamping or incised chevron decorations are confined to the near rim portion of the pot. Following in temporal succession, Clasons Point Stamped vessels are round bottomed, stamped in horizontal or chevron-like lines on an incipient or appliqued collar using the edge of a scallop shell. Found in context with Clasons Point, the Van Cortlandt Stamped type is also round bottomed, paste similar to Clasons Point Stamped, cord-wrapped stick stamped in horizontal lines on the vessel neck and appliqued collar. The East River Cord-Marked type is found in context with all phases of the East River Ceramic Tradition. Like Windsor Cord-Marked, the type is collarless, completely impressed on the exterior with cord wrapped paddle tool impressions, and with no decorative applications, Wall thickness of all East River Tradition phases averages 1/4 in.

Eastern Incised Ceramic Tradition

Eastern Incised, the final pottery type recovered in western coastal New York, shows no typological relationship to any of the Early or Middle Woodland period vessels made by the indigenous coastal occupants. My recovered specimens of this type are all of small size, rarely exceeding 1/2 in. Paste is hard and well consolidated. Vessels are thought to be of small size and globular bodied. Rims are collared with two to four castellations decorated with incised lines of combined diagonals, verticals and horizontals placed in opposition to each other. The lower margin of the collar is usually notched. Possibly inspired or introduced into the area during lower New York's seventeenth-century Iroquoian trade. Notably found in Eastern Incised vessel context, are small, well made flint and jasper, equilateral and isosceles triangular projectile points typical of Iroquoian manufacture.

Hypotheses and Interpretation

Zone decorated potsherds closely resembling Abbot ware recovered at the Abbott Farm Site in New Jersey have been found in archaeological contexts with indigenous coastal New York Middle Woodland period Windsor ceramics. Also recovered in these contexts are stemmed and lanceolate projectile points predominantly made of purple argillite. Argillite, the stone used in the manufacture of coastal New York Cony points and associated bifaces, was traced to sources in the Delaware Valley. A physicochemical analysis of this rarely recovered material was found to be virtually identical to argillite outcrops in western New Jersey and adjacent Bucks County, Pennsylvania (Venuto 1967: 21-29). On the basis of these observations, it is plausible to view the aberrant ceramic and lithic material assemblage as evidence of a southern-based group's home range and indicates the possibility of a migration into western coastal New York during the Middle Woodland period.

If true, this migration into the coastal New York area might have necessitated an adaptation within both the natural and social environments. It is speculated that the Abbott culture migration into the Windsor area of coastal New York injected, not only elements of their unique material cultural baggage, but possibly affected the indigenous Windsor culture's sphere of influence in coastal New York. Such an undertaking might infer a period of instability within the Abbott peoples' home range similar to that of the Nanticoke of coastal Maryland who were closely affiliated linguistically and culturally with the Delaware. The Nanticoke, carrying the bones of their dead with them, left Maryland about 1730 and migrated northward to southern New York State, an area then under the domination of the Iroquois (Bushnell 1920: 24). These migrants had, without doubt, resolved to establish a new settlement further north and apparently were readily accepted among the Iroquois, possibly to help remedy Iroquois population attrition.

An earlier documented instance of migration to New York State involved the movement of 1,500 Tuscaroras whose land had been taken from them. These people fled north from the Carolinas and joined the League of the Iroquois in 1713-1714 (Boyce 1978: 287). We can only speculate on the number of waves of migration that may have preceded these two recorded instances in prehistory. Like the Nanticoke and Tuscaroras and the Iroquois, the Windsor and Abbott peoples home ranges were not geographically close; however, they may have had common kinship ties that allowed amiable affiliation.

Based on tenuous archaeological and scarce archival evidence of cultural trait diffusion or migration, areal reconstruction based on data recorded in western coastal New York was difficult. No sites have been discovered which would allow one to trace the Abbott cultural movement from the Delaware Valley to coastal New York; nor has there been evidence to demonstrate whether an overland or water route was utilized by the Abbott people in their journey to New York. If travel were confined to the use of canoes, scant surviving remains would mark the travelers' stops along the way. Only the essentials of subsistence would be transported while in route, possibly limited to food, simple tools and less perishable items.

Other than the Middle Woodland period plausibility of a Windsor and Abbott people's dual occupation of western coastal New York, we do not know if any technological or domestic materials were borrowed, modified, or eliminated during this association. At eight sites, archaeology revealed the mutual cohabitation of both Windsor and Abbott people involved in shellfish gathering and hunting (Table 1: 6, 14, 17, 18, 19, 24, 26, 27). At six other sites, these activities were conducted, but the only the diagnostic cultural material recovered was that of the Windsor Complex. No evidence of a single Abbott diagnostic artifact was found in context to predicate a cohabitation by the two peoples, or the possible acquisition of a diagnostic Abbott item by trade (Table 1: 1, 15, 20, 21, 22, 23). The Early to Late Woodland periods of occupancy were represented by the Windsor, Abbott and East River complex cultural material assemblages recovered at the Pelham Boulder Site, Bronx County, New York (Table 1, 14). At the Oakland Lake Site, Queens County, New York (Kaeser 1974: 1-26; Table 1, 27), the archaeological record illustrated the continuous occupation of the site from the Late Archaic to the Late Woodland period. The Late Woodland period of Native American occupation of the Pelham Bay Park area was recorded at 13 sites, utilized as shellfish gathering stations by people of the East River Complex Bowmans Brook and Clasons Point phases (Table 1: 2 -12, 13, 14, 16, 23).

It can now be ascertained that there is no archaeological evidence of an attempted duplication of Abbott Zone vessel decoration, or adoption of the Cony projectile points morphological style into the Windsor material assemblage. Evidently, the individuality of the traditional ceramic and lithic Windsor and Abbott traits were retained by their makers during their cohabitation in coastal New York. It is reasonable to assume that some sites were mutually occupied by both groups as indicated by the stratigraphic mix relating to the two complexes (Table l: 6, 14, 17, 18, 19, 24, 26, 27). Although an alternating series of site occupations might be conceived when characterized by the absence of definitive Abbott culture elements, this phenomenon more likely denotes the site occupation to be that of the Windsor, Early Woodland period, North Beach phase that I believe preceded the entry of the Abbott Complex into coastal New York (Table 1: 1, 15, 20, 21, 22, 23).

Fortuitously, an edifying ceramic and lithic cultural material assemblage diagnostic of the Abbott Complex was recovered at the Bird Rock Site in Pelham Bay Park. Small in dimension and probably visited for a very short interval of time, the site yields corroborative affirmation of an Abbott Complex occupation and its existence in the area under study. This site is postulated to be a pure component of the Abbott Complex (Kaeser 2004b: 53-60: Figure 5, 6).

While the archaeological data collected at 27 sites could not be interpreted as a fusion of the Windsor and Abbott material cultural traditions, the evidence suggests a shared occupancy of some sites where inhabitants were involved in shellfish gathering activities. No radiocarbon dates permit an absolute temporal determination of the Windsor or Abbott occupation limits. The most significant data demonstrating the timing of a common Windsor and Abbott occupation in the Pelham Bay area is the recovery of Abbott ceramic ware recovered in context with ceramic types that characterize the

Late Middle Woodland period Windsor Clearview phase. At most sites where Abbott Tradition sherds and Cony projectile points were recovered, Clearview phase Windsor Brushed, North Beach Net Marked and Clearview Stamped sherds were found together in stratigraphic context.

Corroborating the final temporal stage of Windsor and Abbott occupancy, the ceramic and lithic assemblage that characterizes the Late Woodland period East River Complex was found to superimpose or be mixed with Windsor Clearview phase culture diagnostics at six sites (Table 1: 6, 14, 19, 23, 27). This hypothesis also can apply when estimating the time of entry of the East River Complex into the area and their subsequent occupation of most western coastal New York shellfish collecting stations.

It can be assumed that the Windsor and Abbott groups' distinctive cultural material traditions were not compromised by the East River Complex's intrusion into the New York coastal area. There is no archaeological evidence that any Windsor or Abbott culture diagnostics were assimilated into the East River Complex's culture material assemblage. Stratigraphic observations indicate that the East River Bowmans Brook phase people replaced the indigenous Windsor and Abbott occupants. The Bowmans Brook phase, was followed by Clasons Point phase elements of the East River Complex. Both material cultural traditions (ceramic and lithic) were superimposed on the Windsor and Abbott Complex middens; these later people also established shellfish collecting stations at locations of their own choosing. The East River culture continued occupancy of western coastal New York into the Late Woodland period (Table 1: 2-5, 7-11,16).

So far, no archaeological evidence has been uncovered to hint of invasion, rampant disease or overpopulation that might have caused the disappearance of the Windsor or Abbott peoples of coastal New York, nor are any other hallmarks of cultural decline discovered that would infer an assimilation of Windsor and Abbott cultural diagnostics into the East River Complex. It can be hypothesized that the Siwanoy, who occupied the Pelham Bay Park area in the seventeenth century may have been descendents of the East River Complex. These people and other confederacy members fought the Dutch and English settlers during the Governor Kieft War and continued their occupation of western coastal New York while it was dominated by the Iroquois. They were finally removed for parts unknown by the incursion of European settlers (Kaeser 1970).

Speculations

It would be fruitful to determine if additional Abbott traits beyond the Cony Stemmed and Cony Lanceolate projectile points, the Cony Knife (Kaeser 2002: 56-59: Figure 1) and the Abbott Zone decorated vessels, were transported into coastal New York during the course of migration and their sojourn with the indigenous Windsor people.

Ongoing research raises the questions, when, why and with whom, did the Cony projectile point, also typologically known as Fox Creek (Funk 1976: 287-295), spread beyond coastal New York into the Hudson Valley, disperse northward to Martha's Vineyard, Massachusetts (Ritchie 1969: 88-124), and spread to coastal sites as far north as Cape Cod (Bradley 2003). Unlike the coastal New York Cony points commonly made of Delaware Valley argillite, and flint from sources in northern New York State, the Martha's Vineyard and Cape Cod, look-a-like points were made of locally procured Massachusetts felsite. Except for ceramics resembling Vinette 1 ware, specimens of Abbott or Windsor ceramic types did not accompany the Cony-Fox Creek point into New England. Whether this discontinuity is based on natural or cultural factors, or on a combination of both, remains a problem for future investigation.

A few examples of scallop shell stamped and net impressed potsherds were found in context with "Steubenville" points (Ritchie 1969: 210) at the Martha's Vineyard, Cunningham Site. Net marked sherds were recorded from the Fredenburg Site, Otsego County, New York (Funk 1976: 287-294). These sherd treatments retained a semblance of the characteristic Middle Woodland period, Windsor Complex, Net Impressed ware, and Late Woodland period, East River Complex, Clasons Point scallop shell stamped decorative vessel treatments that the Middle Woodland and Late Woodland period potters popularized in coastal New York.

Biface collections recovered at Hudson River Valley sites are predominately made of flint, some of jasper, and almost no argillite, the stone that morphologically defined the Cony projectile point type in coastal New York. Tracking the northern movement of the Cony projectile point types northern movement ont of coastal New York, argillite specimens became scarce, no doubt due to the increasing distance from the source of supply. In the Cony- Fox Creek points' northern movement, Hudson Valley flint was replaced by the more accessible New England felsite. It is also evident that the diagnostic Windsor and Abbott ceramic vessel types that accompanied the Cony points in coastal New York diminished in the lower Hudson River Valley region and abruptly disappeared.

Archaeological data do not provide evidence for reconstruction of the diet of the sites' multi- cultural occupants, their seasons of gathering practices, or their rituals. Thus far, instances of documented human and dog burials recorded in the area of Pelham Bay Park are attributable to the mortuary practices of the Late Woodland period, East River Complex (Kaeser 1970: 9-34; 2004a:51-64). Although people of the Windsor Complex are thought to be the culture group of longest residency in western coastal New York during the Woodland period, their rarely discovered burial places were not located in close proximity to their known shellfish collecting stations. The remains of one vandalized human burial, is inferentially dated to the Middle Woodland period, Windsor Complex. The provenience of this interment was established by a Jack's Reef Corner notched projectile point recovered from the grave matrix. This burial was discovered in close proximity to a ceremonial mass burial place of the Late Woodland period, East River Complex (Kaeser 1970: 9-34).

Midden contents at all excavated sites indicated that the basic activity of all the Woodland period occupants was seasonal collection of the local salt water species of shellfish. Stone fishing net weights were common finds, but the remains of the netted catch were exceedingly rare. The scatter of smashed white-tailed deer bone is common, primarily long bone fragments that yielded marrow or possibly bone grease besides meat. The bones of small mammals that could supply edible meat or skins, exhibited no stone tool percussion or cutting marks, or animal tooth marks which would indicate evidence of scavenging carnivore consumption. Burned, late fall ripening hickory nutshells were found intermixed with the shellfish debris. The remains of black fish and blue-claw crab denote the fall period of inshore bay fishing. All identified bivalve and conch mollusk species were obtainable until the winter season made the sites untenable.

It is clear that the easily discovered single aspect, shellfish collecting sites cannot provide a complete picture of a people who must have been engaged in many activities during their seasonal collecting rounds. To balance this one sided impression of shellfish which unquestionably constitutes only a part of the complete settlement pattern, it is necessary to search for and excavate collecting sites located beyond the coastal area that could mark the various sources of the material necessities of life.

The absence of recorded prehistoric archaeological village site evidence that would mark them as established inland dwelling places is most likely due to modern urban sprawl that accelerated in the post-war, mid-1900s, the construction of a series of major highways and the limited search to which these areas have been subjected. In their cyclical movement from coastal shellfish collecting to inland gathering places, it is assumed that lightly constructed, temporary shelters were sufficient to house these mobile people. Bark, reed mat or hide covered shelters framed with cut saplings if shallowly planted in the ground, would be virtually unrecognizable as post mold evidence of shelters in the black midden soil.

No lithic biface workshop or quarry has been discovered within the area under study. Scant collections of quartz, quartzite, chert, flint, jasper and argillite detritus were recovered from the preliminary recorded and salvaged sites, most of which were originally obtained from non local sources. Typical stone knapping waste does not exhibit the preliminary flake scars that would be apparent as the result of percussion shaping and the thinning of quarry blanks. The few recovered argillite flakes recovered, are small pressure - thinned chips produced during the repair of edged implements that had seen heavy use or accidental breakage. The preference of argillite, the material predominately used in the manufacture of Cony bifaces, and evidence of the stone types value and limited supply in coastal New York, is indicated by the recovery of salvaged broken stemmed and lanceolate projectile points that had been reshaped as drills and hafted scrapers. Tips of Cony points that had been accidentally broken in manufacture, or butchered out of kills also evinces the reuse of damaged projectile point bases.

Conclusions

Problem oriented, this study has endeavored to demonstrate the amount and kinds of data that are recoverable through archaeological site and museum collection survey. Not only can numerical occurrences and material culture typology be factored in, but also one can make a number of reasonably accurate deductions of a processual nature relating to the behavior of the people responsible for the archaeological manifestations. I sought to collect information that would define the Windsor and Abbott Middle Woodland period cultural material attributes recovered in the Pelham Bay Park area and environs, and if possible, to test the northern limits of the archaeological manifestations if they spread beyond coastal New York. Inclusion of salvage site data proved valuable.

In my formative efforts, there was a danger that archaeological colleagues would accept too readily the findings that I set forth as hypotheses for further research, or reject too quickly my tentative propositions. It was hoped that by introducing a new cultural complex into coastal New York prehistory, I would stimulate study and provoke controversy and even opposition (Funk 1976: 287-295; Kaeser 2006: 63-69). If the results of my efforts were to have merit, the data collected during the course of my earlier investigations were to be recognized as indicative rather than inferential. Consonant data drawn from my final archaeological site and museum collection survey indicated that badly disturbed sites when closely examined, could richly repay the researcher.

Table 2. Cultural materials Recovered from Pelham Bay Park Salvage Sites, Bronx County, Morris Estate Club Site, Bronx County and Oakland Lake Site, Queens County, New York.

Site No.	Recovered Ceramics and Other Cultural Materials
1	Windsor; (8) Windsor Cord Marked sherds.
2	East River; (13) East River Cord Marked, (1) Bowmans Brook Stamped, (1) Clasons Point Stamped.
3	East River; (17) East River Cord Marked, (4) Eastern Incised, (1) Cayadutta Incised, (1) Madison Point, (15) unknown sherds.
4	Windsor-Abbott-East River; (32) East River Cord Marked, (1) Bowmans Brook Stamped, (8) Windsor Cord Marked, (6) Clearview Stamped, (3) Eastern incised, (77) unknown sherds, (1) Madison Point, (1) Cony drill.
5	East River; (1500) East River Cord Marked, (54) Clasons Point, (94) Bowmans Brook, (26) Van Cortlandt, (32) Eastern Incised, (21) Cayadutta Incised, (3) Milo Cord Marked, (1) Finger Nail Stamped, Stemmed, (1) pipe bowl, (5) pipe stem fragments, (8) stemmed and Levanna points, (1) Steatite bowl rim, Levanna and Madison points, Misc. Stone netsinkers, hammer and anvilstones, (1) abrading stone and (1) maul, and bone and antler tools, cache of Limonite.
6	Windsor- Abbott; (8) Windsor Cord Marked, (6) Clearview Stamped, (62) unknown sherds, (1) Cony drill.
7	East River; (45) East River Cord Marked, (8) Bowmans Brook Stamped, (5) Incised and Punctate, (1) combo end and side scraper, (1) netsinker, (1) combo scraper, knife, spoke shave, (1) hollowed stone possible socket for fire drill.
8	East River; (1) restored, Bowmans Brook Incised Bowl, (149) Clasons Point, (80) East River Cord Marked, (36) Van Cortlandt Stamped, (3) Levanna points, (4) celts, (2) scrapers, (1) ovoid knife, (1) netsinker, (2) anvils, (3) biface blanks, (1) ulna awl, (1) antler flaker, (1) ocher paint stone.
9	East River; (45) East River Cord Marked, (1) Bowmans Brook Incised, (4) Clasons Point Stamped, (1) knife, (1) pottery smoother.
10	East River; (11) East River Cord Marked, (1) Clasons Point Stamped, (5) Bowmans Brook Incised, (2) point fragments, (1) hammer, (1) blank.
11	East River; (6) East River Cord Marked, (1) Bowmans Brook Stamped, (1) Clasons Point Stamped, (1) muller, (1) pestle fragment, (1) spokeshave.
12	East River; (23) East River Cord Marked. (4) Levanna points, (1) celt, (1) double pitted anvil, lanceolate blank, (1) limonite paint stone, (10) dog burial.
13	East River; (?) Milo Cord Marked. (?) East River Cord Marked, (?) Levanna points
14	Late Archaic, Windsor- Abbott -East River; (?) all phases of Windsor. Abbott and East River ceramic traditions. (?) numerous Cony Lanceolate and Stemmed points. Misc. points of Late Archaic to Middle Woodland periods, Stone choppers, hammers, anvils, netsinkers, scrapers, knives, Misc. bone and antler tools.
15	Windsor; (17) Windsor cord Marked, (2) netsinkers, (1) chopper.
16	East River; (21) East River Cord Marked, (9) Bowmans Brook incised, (3) Clasons Point Stamped, (5) Bowmans Brook Stamped, (108) unknown sherds, Point and Blank fragments.
17	Late Archaic-Windsor- Abbott; (13) Misc. Late Archaic to Middle Woodland period points, (1) Cony Lanceolate point, (2) Vinette1 sherds, (2) side scrapers, (1) thumb-nail scraper, (1) hammer, (2) worked core, (2) biface blanks, (1) limonite paint stone .
18	Windsor-Abbott; (8) Windsor Cord Marked, (2) Abbott Zoned incised, (7) Vinette1, (1) Windsor Net Marked, (1) Cony Stemmed point, (2) Cony Lanceolate point, (3) Cony point tips, (1) Levanna point, (1) side-notched point, (1) antler tine, drilled red slate pendant fragment
19	Windsor-Abbott-East River; (9) East River Cord Marked, (6) Bowmans Brook Stamped, (1) Windsor Net Marked. (3) Windsor Brushed, (3) Abbott Zoned Incised, (7) unknown rimsherds, (9) Punctate, (1) Cony drill, (1) Cony Stemmed point, (1) Cony Stemmed base, (Levanna blank, (1) finger-nail scraper, (1) antler tine tool. (1) bone awl.
20	Windsor; (7) Windsor Net Marked, (1) Vinette 1, (1) antler tip point, (1) ovoid knife. (1) knife-chopper .
21	Windsor; (5) Windsor Cord Marked, (1) biface blank, (1) knife fragment, (1) knife-scraper, (1) antler tine tool. (2) bone awls .

Table 2, continued

22	Windsor; (2) Jacks Reef points, (4) triangle point fragments, (3) triangle points, (1) full grooved axe, (1) 3/4 grooved axe, (2) grooved axe fragments, (1) grooved hammer, (1) chipped axe, (1) pestle, (1) poll, axe or adz, (2) ovoid blanks .
23	Windsor-East River; (14) Windsor Cord Marked, (5) Windsor Net Marked, (7) East River Plain, (4) Bowmans Brook incised, (1) Vinette 1, (3) Clasons Point Stamped, (1) Bowmans Brook Stamped, (5) Net marked (1) point tip, (8) unknown Cord Marked, (1) Triangle point tip, (4) Bone awls.
24	Windsor-Abbott; (14) Windsor Net Marked, (6) Windsor Brushed, (3) Abbott Zoned Dentate, (1) Abbott Net Marked, (1) Cony drill, (1) Cony Stemmed scraper, (2) Cony Lanceolate points, (1) Stemmed scraper.
25	Abbott; (6) Abbott Zoned Dentate rimsherds, (65) Abbott bodysherds, (1) Cony Stemmed point base, (1) Cony knife, (1) Willow leaf point, (1) cache blade, (1) Quartz core.
26	Windsor-East River; (4) Windsor Brushed, (5) Vinette 1, (28) North Beach Brushed, (32) Clearview Stamped, (69) North Beach Net Marked, (15) East River Cord Marked, (22) Bowmans Brook Incised, (74) plain, (1) punctate, (2) Brewerton Side Notched points, Point fragments and Blanks, (2) Brewerton Side Notched points, (1) corner removed point, (1) pestle, (5) point tip fragments, (5) bone awls, (1) antler tine wedge, (2) drills, (1) anvil, (1) hammer, (150) sheets Mica .
27	Late Archaic-Windsor-Abbott- East River; (63) Vinette 1, (2) Cayadetta incised, (39) Abbott Zoned Incised, (87) North Beach Net Marked, (45) Eastern Incised, (2) Abbott Zoned Dentate, (1) Clearview Stamped, (243) Abbott Zoned Net Impressed, (111) Modified Vinette, (373) Windsor Cord Marked, (84) Plain, (5) Interior Brushed, (2) Cord on Cord, (5) Incised and Punctate, (2) Horizontal Incised, (13) Cony Stemmed points, (5) Cony Lanceolate points, (4) Levanna points, (2) Madison points, (9) Normanskill points, (2) Brewerton Side Notched points, (2) Bare Island points, (2) Rossville points, (3) triangle blanks, 2 combo hammer and anvilstones, (4) double pitted hammerstones, (9) pebble hammers, (1) side-notched hammer, (3) netsinkers, (5) choppers, (1) lanceolate knife, (1) trianguloid knife, (1) Cony stemmed scraper, (3) thumbnail scrapers, (1) side scraper, (1) end scraper, (1) drill, (17) bone awls, (43) Limonite paint stones.

As a result of excavation recoveries and data interpretation, the distinguishing types of artifacts utilized by the Middle Woodland period indigenous Windsor complex and those of a newly recognized culture entity I call Abbott, were segregated and defined. By tracing ceramic and lithic typological identification, I proposed a Delaware Valley area of origin and the direction of the traits' diffusion into coastal New York. To distinguish the Steubenville point from the generally adopted, Archaic period horizon in coastal New York, I named the point "Cony" as a purely utilitarian acronym combining the first two letters of the word Coastal and the abbreviation for New York, and hypothesized a Middle Woodland period provenience for the Cony-Fox Creek projectile point (Funk 1968: 1-7; Kaeser 1968a: 8-26).

The study of Indian cultures in coastal New York's Windsor -Abbott Complex in the Middle Woodland period and the East River Complex and League of the Iroquois in the Late Woodland and Final Woodland period, shows a similar scenario with the co-existence of two cultures, rather than independent groups. Added to this could be cultural integration and dissolution resulting from European intrusion and documented evidence relating to Iroquoian dominance and the absorption of weaker neighbors into their large political system.

Although this research has not definitively answered all of the questions raised, it is hoped that it supports the variety of hypotheses formulated in the mid-1950s, and those derived from my more recent observations. It is also hoped that future methods of scientific research will allow techniques of data recovery that will clarify the disparate hypothesized origins, migrations, final destinations and reasoned explanations for the disappearance of the prehistoric Windsor and Abbott population. These people did not simply vanish without leaving a trace.

Still in the infant stage of research, but especially interesting for archaeologists, is a new technique that measures the ratio of strontium isotopes in human bone and tooth enamel. The strontium isotope ratio of tooth enamel matches the geology in the area where a person spent childhood. Bone strontium changes over a seven to ten-year period reveal the region where the person spent the last decade of life. These data can indicate if a person migrated between childhood and death, and can pinpoint where a person was born. The future marriage of mitochondrial DNA and strontium isotope research might provide a wealth of answers to questions pursued by the physical anthropologist, research archaeologist, and even the concerned avocational archaeologist.

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Evidence of Ritual Practices at the Pethick Site, Schoharie County, New York

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Archaeologists often avoid considering ritual practices. One means of investigating ritual practices is connecting ethnological and ethnohistoric observations of ritual material culture and looking for similarities with material discovered on archaeological sites. This approach is adopted for the Pethick Site in Schoharie County. Two examples are discussed. I interpret an anomalous deposit of animal bone in terms of Native American medicine bag practices and I describe several fragments of smoking pipes in relation to the ritual significance of tobacco smoking in Native American cultures. I conclude with a discussion of future investigations into ritual practices at the Pethick Site.

Introduction

The Pethick Site is located in the Town of Central Bridge, Schoharie County, New York, about 30 miles west of Albany (Figure 1). While identified in a CRM survey of the area, local collectors and avocational archaeologists have long known of its existence and significance. The site has been the location of a cooperative excavation by the University at Albany and the New York State Museum since 2004. The site has already yielded significant insights into regional resource procurement (Rafferty et al. 2007; Rieth et al. 2007), and has provided data for numerous graduate research projects. Excavations are ongoing, and are planned to continue for the foreseeable future.

Several ecological, geological and geographic features combine to make Pethick's location highly favorable. Nearby Schoharie Creek allowed occupants of the site easy access to the Mohawk River, providing a ready route of transportation to regions throughout upstate New York. The floodplain of Schoharie Creek consists of rich, fertile silt loams, and provides substantial expanses of arable land adjacent to the site. Located on the first terrace above the floodplain, however, the site seldom experiences flooding. A nearby promontory of the valley wall, known as Terrace Mountain, contains significant deposits of Onondaga chert (Ritchie and Funk 1973:125); abundant clay deposits suitable for pottery manufacture are also located nearby, and excellent aplastic tempering material is available from local streambeds. The region surrounding the site provides abundant subsistence resources, including riverine and terrestrial foods. All these factors made the Pethick Site an ideal place to live, and it is no surprise that the site was repeatedly occupied for over 4,000 years.

The site was identified by staff from the New York State Museum in 1969 during a roadside survey, but the majority of the site was outside of the project area and was not investigated at that time. The site came to the author's attention again in the summer of 2004. One week prior to starting excavations at a nearby site where the 2003 season of the University at Albany's archaeology field school had taken place, access to the property was denied. Fortunately a local collector and avocational archaeologist suggested that we contact the owners of the parcel containing the Pethick Site in the hopes that the field school could be relocated there. The property owners enthusiastically agreed, and the Pethick Site project was born. This course of events provides a clear example of the potential positive results of cooperation between avocational and academic archaeologists.

Since its inception, the Pethick Site has undergone five seasons of excavation, with a sixth season scheduled for the summer of 2009. Based on current evidence recovered from the site, Pethick can be briefly summarized as follows. The site has substantial Early Woodland (1000 B.C.-1 A.D.) and Late Woodland (A.D. 1000-1550) components. The site served as a repeatedly occupied camp site during the Early Woodland period, and was the site of a small village of Iroquoian farmers during the Late Woodland. There is also evidence of less extensive Late Archaic (3000-1500 B.C.), Transitional (1500-1000 B.C.), Middle Woodland (A.D. 1-1000), and Contact period (A.D. 1550-1650) occupations of the site, in addition to a nineteenth-century structure. These occupations are indicated through both diagnostic projectile points and ceramic sherd types, as well as a substantial and increasing array of radiocarbon dates.

The site has yielded a substantial assemblage of artifacts, including over 200,000 lithic tools and debitage, over 2000 pottery sherds, a substantial if fragmentary faunal assemblage, macro- and micro-botanical remains, and nearly 300 subsurface features. At least two substantial longhouse structures dating to the Late Woodland period were present

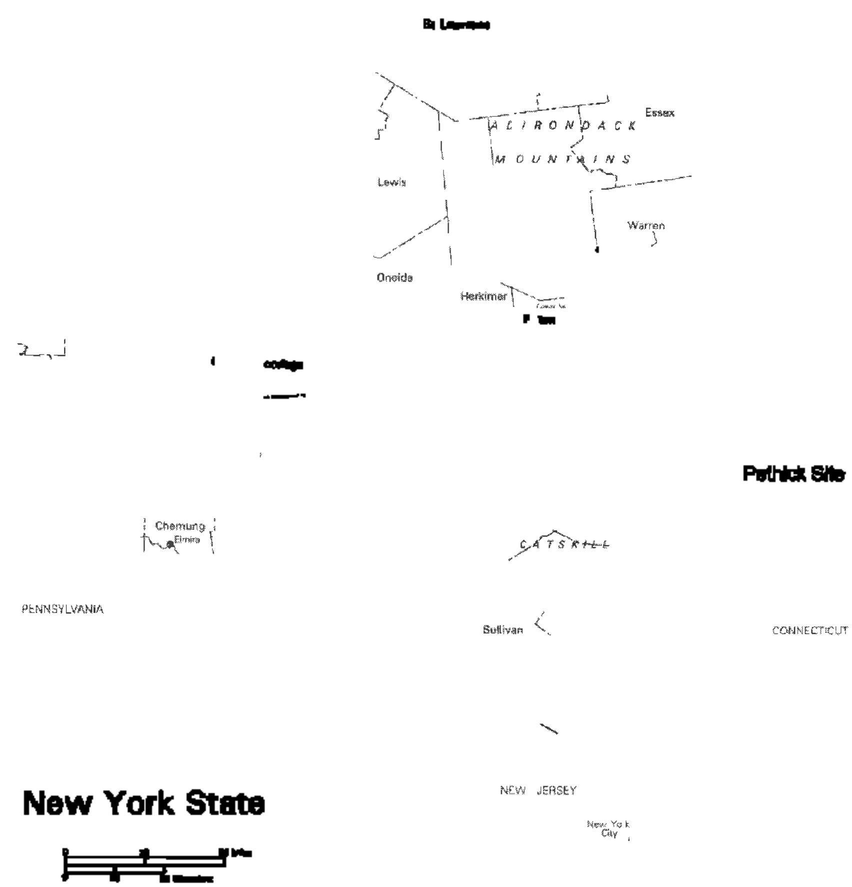

Figure 1. Location of the Pethick Site in New York State.

on the site as indicated by post hole patterns and other associated features. An Early Woodland period structure was likely present, as well, based on post hole and artifact evidence, but is less clearly defined. No fortification evidence has yet been identified but the area currently uncovered is too constrained to rule out this possibility.

The sizeable assemblage of the site, and the better than average preservation characteristics, has made possible the discovery of less common artifact types that have significance beyond technology or subsistence. Such artifacts have implications for the spiritual and religious lives of those who dwelt at Pethick, and allow the interpretation of possible ritual practices.

Evidence of Ritual Practices at the Pethick Site

Ritual practices are central to all cultures, past and present. Few would relegate such practices, with their social and religious significance, to secondary importance in favor of material aspects of human behavior, such as technology or subsistence. Yet, that is precisely what archaeologists have done as a matter of course for the majority of the history of our discipline. This preconception was reinforced during the development and dominance of the materialist-focused approaches favored by archaeologists up until the late twentieth century. When viewed from this perspective, ritual behavior became little more than a convenient receptacle to contain archaeological patterns that defied materialist explanations (Barrett 1991). Anomalous material culture was commonly dismissed as ritual without any significant investigation of what that meant for past lifeways.

The reticence on the part of many archaeologists to grapple with prehistoric ritual began to be questioned as many of the basic assumptions of archaeology were coming under criticism. This involved a fundamental shift in mind set, in the realization that ritual behavior could leave material traces that might be used to draw interpretations regarding their meaning (Barrett 1991:1; Brown 1997; Fogelin 2007:61; Merrifield 1987:1; Renfrew 1994). Moreover, ritual practices came to be viewed not as secondary, but as a central focus of study. The ability to draw meaning from the archaeological remains of past ritual is not simply an interesting addition to the foundations of more traditional archaeological concerns. Indeed, interpretations of ritual are every bit as fundamental, and ignoring possible ritual meanings in archaeological data can result in incomplete or false conclusions.

I will describe two examples of material culture from the Pethick Site that can be interpreted as resulting from ritual practices undertaken by the site's occupants. I will show that the analysis of such materials can provide a far more nuanced and contextual view of the lives of prehistoric people than would be the case were they ignored.

Medicine Bags

The first example of artifacts with ritual significance is an intriguing deposit of animal bone (Figure 2). The vast majority of faunal evidence from the site relates to the subsistence utilization of medium and small mammal species, dominated by white tail deer. However, one deposit of animal bone does not appear to have a subsistence-based explanation. A tightly packed cluster of mammalian phalanges was found on the margins of a hearth feature in deposits that are stratigraphically affiliated with the Late Woodland occupation of the site. While the bones were densely clustered, they were not articulated; this was not a discarded limb, but a bundle of bones that had been contained in a bag of some perishable material. Consultation with faunal and osteological specialists from the University at Albany's Anthropology Department identified the bones

Figure 2. *Ursus americana* bones from the Pethick Site

as those of a bear, most likely the American black bear (*Ursus americanus*).

The containment of animal bones in hide or cloth containers is consistent with the Native American practice of the "medicine bag," a practice that has been documented in both ethnographic and ethnohistoric literature for native cultures throughout North America. Medicine bags were typically made of animal hide, and ethnohistoric or ethnographic accounts from the Northeast indicate that the skins of *Mustelidae* species (mink, martin, otter, fisher, etc.) were often preferred over other animals (Blackwood 1929; Radin and Reagan 1928; Skinner 1913, 1925; Vennum 1982:115). Of particular relevance to this example is a correlation between bears and medicine bags. The bear was a common symbol of the Great Spirit of native pantheons, and bear paws made particularly potent medicine bags, either as the bag itself or as its contents (Vennum 1982:181).

Medicine bags were used to contain items of spiritual significance. These objects were seen to represent what Iroquoian societies termed orenda or the physical embodiment of spiritual and magical power (Engelbrecht 2003; Hewitt 1902:37; Radin 1914:346; Vecsey 1986:82). A common example is the bones of spiritually significant animals, and few animals were accorded as much spiritual significance as bears (Brown 1997; Hallowell 1926; Hultkranz 1979). The bear embodies several characteristics that made them spiritually significant figures in the native environment. Bears could walk like humans, and used their hands in a human-like fashion (Jackson 1961:315; Kurath 1964:66; Skinner 1914:203). Bear carcasses (once skinned) resembled human corpses, bear footprints were similar to those of humans, and many bear bones, especially those of the paw, resembled human bones (Gilbert 1990:68, Wallace 1949:39). As omnivores, they competed with humans for food. Perhaps most significantly, bears disappeared under the ground for entire seasons, and were therefore associated with the native underworld. Given these qualities, it is not surprising that bears feature prominently in shamanistic religions wherever they coexist with human societies (Balzer 1996; Brehm 1996:681; Eliade 1972:458-9). All of these factors contributed to their prominent role in Native spirituality and mythology (Berres et al. 2004).

Other examples of faunal clusters being interpreted as the remains of medicine bags have been cited, such as that from burial contexts in late Iroquoian sites (White 1967). Perhaps the most notable such example was recovered from the Early Woodland Boucher Site in Vermont (Heckenberger et al. 1990), where perishable materials, such as fibers and leather (including fragments of a hide bag containing the bones of a large snake) are preserved. The similarity to the patterns noted at the Pethick Site is compelling evidence that we are also dealing with a medicine bag. This leaves the question of what led the artifact to be deposited as it was found.

Comparison to the ethnological record for the Northeast leads us to suggest that this was an intentional, rather than accidental deposition event. When medicine bags are found on archaeological sites, they tend to be in sealed features, such as hearths or burials. There is so far no evidence of mortuary activity at Pethick, and the feature that contained the bone cluster was a hearth. It may be that the bag was intentionally placed in or near a fire as a means of disposing of or destroying it. The intentional disposal of medicine bags by Native Americans was generally seen as a sacrifice of a spiritually powerful object. The ritual disposal or 'killing' of such artifacts was a common practice among native cultures. The causes of sacrifice of ritual objects are numerous: vision quest, rites of passage, death of the owner, or other extreme events. The event that led to the disposal of this particular object cannot be determined, but we can suggest that the occupants of the Pethick Site may have been engaging in rituals of strong cultural significance involving the destruction of spiritually powerful artifacts.

Tobacco Pipes

A second example of ritual practices at Pethick is represented in the remains of smoking pipes. Ethnohistoric accounts show that tobacco use was ubiquitous to Native American cultures of the Contact Period (Springer 1981). Tobacco is the generic name for plants of the *Nicotiana* genus; the most widespread species in North America, *Nicotiana rustica*, is actually native to South America (Pearsall 1992). *Nicotiana rustica* has the highest concentration of nicotine of all *Nicotiana* species. Nicotine has a variety of physiological effects, and in large doses causes hallucinations (Joniger and Dobkin de Rios 1973, 1976).

Evidence for early tobacco use is scanty. The oldest dates for tobacco are from northern Peru between 2500 and 1800 B.C. (Pearsall 1992:178). The earliest eastern North American evidence (from the central Mississippi Valley) ranges between A.D. 100 and 200 (Asch 1991, 1994:45; Haberman 1984:271; Wagner 2000; Winter 2000). Early dates for the rest of North America fall after A.D. 400 (Asch and Asch 1985:196; Haberman 1984:272-273; Wagner 1998:840).

There is a temporal gap between the evidence for tobacco and the evidence of smoking pipes. The earliest known pipes in North America date to the Late Archaic Period, over a thousand years prior to the earliest known botanical evidence. A pilot study using chromatographic residue analysis has provided some indication that tobacco does date earlier than current botanical evidence has indicated. Two smoking pipes, each dating to between 300 and 500 B.C., were tested in this study. Organic compounds indicative of the decay of nicotine were detected in both pipes, evidence that they were used to smoke tobacco (Rafferty 2002, 2006). These results deepen the chronology of tobacco by several hundred years.

There is ethnographic, ethnohistoric and archaeological evidence that the pipe smoking was a ritualized act among Native Americans. The author has addressed this extensively (Rafferty 2002, 2004, 2005a, 2005b, 2006, 2007a, 2007b), so only a general summation is offered here. One line of evidence is context: when found *in situ*, pipes are commonly found in burials. This tendency increases for earlier periods, and Early Woodland period pipes are almost exclusively found in burials. Even in late prehistory or the historic period, when increasingly sophisticated ceramic technology allowed for larger numbers of pipes, ethnographic evidence (e.g., Paper 1988) and ethnohistoric evidence (Springer 1981; von Gernet 1992) shows a ritualistic attitude towards smoking, as is generally common with the use of mind-altering substances in traditional societies.

Rituals that included smoking were often those that facilitated social interaction. The classic example is that of the historical calumet. While the inception of that particular ritual practice may at present be unclear (Blakeslee 1981; Brown 1989; Hall 1977), what is less contentious is that calumet-like rituals, where mutual smoking facilitated interactions between strangers for trade, exchange, military alliance, or other necessities, were relatively common historically and prehistorically (Drooker 2004; Mann 2004; Rafferty 2004).

Pipes recovered from the Pethick Site fall into two categories: clay and stone (Figure 3). Nine ceramic pipe fragments have been recovered from the site so far, including both stem and bowl fragments. One bowl fragment contains exterior horizontal lines and although not complete, is similar to trumpet forms found on Late Woodland village sites in the adjacent Mohawk Valley.

The morphology and material of the stone pipe fragments are consistent with blocked-end tubular pipes affiliated with the Early Woodland Period. Such pipes are most closely associated with the Adena complex of the Ohio River Valley (Rafferty 2007b), though examples also occur in contemporary archaeological complexes in the Northeast and Mid-Atlantic regions. Some of these pipes were apparently made of Ohio Valley raw materials, indicating trade between regions. Other pipes appear to emulate the form of Ohio Valley pipes, but in locally-available materials. The stone pipe fragments from Pethick are visually consistent with Ohio Valley pipestone, and may indicate the existence of connections between the Schoharie Valley and regions to the south. However, a geochemical assay similar to those already conducted for pottery and chipped stone artifacts (Rafferty et al. 2007; Rieth et al. 2007) would be necessary to prove this connection.

Figure 3. Stone Smoking Pipe Fragment from the Pethick Site.

To summarize, the limited evidence of ritual activities at the Pethick Site is consistent with what one might expect from a society that practiced a generally shamanistic spirituality. This includes the presence of personal power objects, in the form of medicine bags. Such objects were historically used to embody and contain spiritual energy for their owner. Also present are objects, in the form of smoking pipes, used to instill altered states of consciousness through the ingestion of mind-altering substances. These were likely used to facilitate the attainment of a spiritual state of mind to sanctify social interactions, both within and between Native American cultures.

Discussion and Conclusions

Additional research into the non-materialist implications of material culture from the Pethick Site is under consideration. For example, ceramics from the site are preferentially manufactured with temper of crushed anorthosite. Grit-tempered pottery could use any variety of aplastic materials in their paste, but all the deposits of burned, crushed temper recovered to date have been anorthosite. This material is not native to the region surrounding Pethick, but derives from the Adirondacks. When heated, the material turns a deep blue-grey in color. There may be some functional advantage to the use of this substance over others; however, the striking visual coloration of the material raises the possibility that it was selected for symbolic reasons. Future research will investigate both the functional attributes of anorthosite temper, as well as archaeological and ethnographic examples of the use of spiritually significant minerals in pottery manufacture among native cultures in North America and beyond.

I have attempted to demonstrate that ritual practices can be approached from the perspective of material culture. Ritual practices consist of symbolic acts with material consequences, which lend themselves to potential interpretation by archaeologists. Ritual practices are fundamental to all societies, and any anthropological endeavor, archaeology included, must take them into account to the extent possible, based on the available material record, or much of the rich variability of past cultures will be missed. The analysis of medicine bags and smoking pipes from the Pethick Site is a case in point. These objects were key symbols in ideological statements made during ritual practices. They provide valuable information on how those who lived at the site interacted with the spirit world, with one another, and with outsiders. Such interpretations should not be taken at the leisure of the researcher, but should be as much a fundamental aspect of prehistoric archaeology as the analysis of technology, subsistence, or settlement patterns.

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The Conservation of Ferrous Metals from the West Point Foundry Site

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The ethical conservation of ferrous artifacts is an ongoing concern for the industrial archaeologists working at the Scenic Hudson Land Trust's West Point Foundry Preserve. Annual excavations at the 88-acre foundry site produce tremendous quantities of iron artifacts and metallic industrial waste. This article reviews the corrosion of metals, as well as those environmental conditions that retard or enhance the rate of corrosion, and presents the results of experiments in cleaning, stabilization, and conservation of ferrous artifacts. The article explains the development of a single overarching logic developed to link field and lab procedures with their underlying theoretical and ethical rationales while considering constraints of both budget and reason.

Introduction

Scenic Hudson's West Point Foundry Preserve includes nearly the entire campus of the foundry's physical plant. Archaeologists from Michigan Technological University's Industrial Heritage and Archaeology Program have conducted research on the preserve since 2001. After two seasons of preparations in archives (Norris 2002) and surveying (Valentino 2003), significant excavations began during the summer of 2003. Archaeological survey and excavations to date have focused upon the waterpower network (Finch 2004), the boring mill complex (Herzberg 2005), the blast furnace blowing engine (Timms 2005), the blast furnace (Kotlensky 2006), and residential structures occupied by workers at both the East Bank House (Deegan 2006, Norris et al. 2008) and Vinegar Hill locations (Deegan 2006 and Kotlensky 2006), as well as one owner's home (Norris n.d.). The preserve now includes nearly all of the original 88-acre (c. 356,000 m^2) industrial core, which now consist of collapsed and generally buried structures full of fragments of broken window glass, roofing slate, fire and

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Excav

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tremendous quantities of iron artifacts and metallic industrial waste. Corroded lumps of unidentifiable ferrous metal, curled lathe and boring waste, sections of wrought iron stock, cast iron fragments, ore and iron slags, tools, nails, screws, bolts, nuts, and other hardware filled screen after screen. These discoveries prompted lively discussions among the professional and student archaeologists participating in the research, regarding sampling, budgeting, methodology, and archaeological ethics. The metal artifacts discussed in this article constitute only part of this problem common to industrial archaeology.

This article explains the plan developed for dealing with ferrous metal artifacts recovered at the West Point Foundry Preserve. Practices evolved following the field season, and as research team members discussed the problem during 2004. Professional archaeologists, students and volunteers initially discussed the rationale for various collection strategies, but have since revised their discussions to include careful attention to the corrosion of metals, those environmental conditions that retard or enhance the rate of corrosion, and the research objectives of the West Point Foundry Archaeology Project. As a result, the 2005-2007 field plans included clear links between field and lab procedures and their underlying theoretical and ethical rationales in light of the constraints of both budget and reason. After discussing these issues, we conclude this article by presenting the preliminary results of experiments in cleaning, stabilization, and conservation of iron artifacts.

Rationale

All of the codes of ethics or statements of professional conduct published by North American archaeological organizations in the past decade include assertions that tie excavation to conservation and preservation.[2] These links stem

[2]The Society for American Archaeology's (SAA) Principles of Archaeological Ethics strongly asserts stewardship as its first issue, and explains: "The archaeological record, that is, in situ archaeological material and sites, archaeological collections, records and reports, is irreplaceable. It is the responsibility of all archaeologists to work for the long-term conservation and protection of the archaeological record by practicing and promoting stewardship of the archaeological record" (SAA 1996) The Archaeological Institute of America's (AIA) Code of Professional Standards includes the statement that "…as primary stew-

from a common underlying support for the preservation ethic. Professional archaeologists are distinguished from looters because they only undertake excavation when properly prepared for the analysis, conservation, and preservation of the recovered artifacts and project records. Those data become part of the scientific and historical record and should be curated in perpetuity.

Given this obligation, archaeologists should not just study the material record of the past, but actively strive to preserve and curate it as well. Operationalizing this basic ethical belief at industrial heritage sites continues to present on-going procedural challenges. The limited project budget in 2004, for example, overwhelmingly restricted both collection and conservation activities, particularly for iron and ferrous artifacts. The West Point Foundry, together with the iron industries that later occupied the site, operated for a century. Iron artifacts, mostly production waste, litter the entire foundry campus. Waste was commonly reused in later construction, earthmoving, and fill episodes. Most of it has corroded into chunks of non-diagnostic, rusted cohesions (hereafter corroded ferrous nodules). The total quantity of iron artifacts and waste probably measures in the hundreds of tons—far beyond any institutional capacity or desire to curate.

Ferrous artifacts, including both objects and industrial waste, will yield important data through which scholars can address compelling research questions. Elizabeth Norris defined the themes guiding the industrial archaeology at the site (Norris 2002). Iron artifacts reflect otherwise unrecorded technical details about the evolving work process, particularly that of assorted tools, machine parts, stock iron, rejected products, and lathe waste. The design and modification of the facilities and their major features, including the blast furnace as one example, will shed light on industrial history. These structures will reveal only part of the story without a systematic study of the raw materials (such as iron ore and coal), waste products (slags, mill waste), and finished products. Ferrous artifacts will provide details important in more than half of the total research themes identified for the research at the West Point Foundry (Norris 2002: Chapter 6). Thus, the collection and conservation strategy for iron artifacts implemented for 2005 therefore connected to the specific research questions each field team member addressed. While the idealistic ethical principles and pragmatic management concerns appeared to conflict, the negotiation between these two concerns provided field school participants with a "teachable moment" to discuss and resolve real-world problems common to industrial heritage site management.

ards of the archaeological record, (archaeologists) should work actively to preserve that record in all its dimensions and for the long term." (AIA 2005: 2). The Society for Historical Archaeology (SHA) includes two related ideas. Principle 2 states: "Members of the Society for Historical Archaeology have a duty to encourage and support the long-term preservation and effective management of archaeological sites and collections, from both terrestrial and underwater contexts, for the benefit of humanity." Principle 4 echoes in saying, "Members of the Society for Historical Archaeology have a duty to collect data accurately during investigations so that reliable data sets and site documentation are produced, and to see that these materials are appropriately curated for future generations" (SHA 2003). The Register of Professional Archaeologists does not include an explicit mandate directing artifact curatorial responsibility, but both the Code of Conduct and the Standards of Research Performance include several provisions that mention the connection between accurate record keeping, artifacts, and long term curation (RPA 2005). The Society for Industrial Archaeology (SIA) has not created an equivalent code or set of standards, perhaps reflecting the significant proportion of architectural historians and material culture specialists in that field who do not deal with excavation as a mode of inquiry.

Collection Strategies

During the 2003 and 2004 summer excavations, field crews undertook complete collection of all iron artifacts in several categories, including tools, personal artifacts, and machine parts. When working in a stratigraphic unit suspected to be floor or feature, they collected all of the nails, shims, bolts, and other hardware, bagged substantial (usually larger than 3/8 in or 7.5 cm, "thumbnail-sized") representative samples of slag and waste, and only those corroded ferrous nodules that exhibited diagnostic traits to aid identification. These traits could include threading, cut marks, articulations, or other surface features suggestive of use or purpose. Research team members also retained sediment samples from floors and features for both magnetic and water flotation analyses. Artifacts deemed outside of these general guidelines were commonly noted in the excavation record, but then dumped with the back dirt. While excavating in stratigraphic layers clearly identified as thick rubble or fill, team members often worked with more liberal sampling guidelines, screening a subset of the buckets produced through excavation and saving those artifacts deemed interesting for analysis or diagnostic as chronological markers. The subset of buckets, which team members dry- or wet-screened as appropriate, served as checks on the sampling system. If something unusual turned up in a screen, the percentage of sediment subjected to screening could be adjusted accordingly.

Once removed from the sediment matrix, artifacts and ecofacts were sealed in polyethylene ziplock bags with appropriate labels for storage until laboratory processing. Research team members began cleaning artifacts in the Cold Spring field lab, but the vast majority of the artifacts were processed in the Industrial Archaeology Laboratory at Michigan Technological University. Research team staff, supported by a grant from the Scenic Hudson Land Trust and matching funds from Michigan Technological University's Department of Social Sciences, completed processing and analysis of the artifacts over the four months following the fieldwork.

Following the first two field seasons, most iron and ferrous artifacts received the same treatment during cleaning and analysis. Staff cleaned the iron of loose dirt and corrosion, using brushes with metal or stiff synthetic bristles. Wooden or steel skewers, picks, or scalpels were used when specific artifacts required that more corrosion be removed for accurate measurement, identification, or analysis. Once finished with the basic cleaning, staff left the artifacts in screens to air-dry over the next 12 to 24 hours. When thoroughly air-dried, researchers put the artifacts into clean bags with new tags and labels. All the artifacts within each stratigraphic unit remained together in bags, but often iron and ferrous objects were bagged separately within the large main bag to isolate them from other artifact types. When appropriate, the lab staff also included silicate desiccant packages within the main bag. Very large individual artifacts, including iron pigs, machine parts, and bolted rods, for example, generally underwent the same basic cleaning procedures. Staff took those objects when dry and attached a wire-threaded heavy paper tag bearing the provenience information. These objects were then moved, along with archival boxes that contained the bags of smaller artifacts into the curatorial storage area at Michigan Tech's Center for Industrial Heritage and Archaeology, until such time as they are returned to the Scenic Hudson Land Trust to be archived at a local repository.

During the fall of 2004, participants in Timothy Scarlett's Archaeological Laboratory Sciences course examined a subset of the ferrous objects that had been in storage from the 2003 and 2004 field seasons. They found that the iron artifacts experienced continued corrosion, in some cases to significant levels. They noted, with some concern, that this continued corrosion occurred to artifacts after only a few months between their excavation in Cold Spring, New York, and their analysis in Houghton, Michigan. Observations also indicated that artifacts from different areas across the site experienced differential degrees of continued corrosion. Researchers therefore undertook a pilot study to develop a cost-effective and time-efficient mechanism for iron and ferrous artifact cleaning and conservation. They determined a set of strategies that research team members might immediately initiate in the field and then carry to completion later in the lab. Different people working on and lab and field research teams needed to make decisions that followed a single logic which might be used to measure the probable significance of objects, assess the chemical conditions by which they measured the probable significance of objects, assessed the chemical conditions in which they worked and initiated an appropriate conservation plan. The lab staff could then build upon the intermediate conservation steps undertaken in the field, rather than attempting to repair the additional damage done during the intervening months. The conservation procedure requires that staff, student, and volunteer team members "connect-the-dots" between determinations of significance, field and laboratory analysis, the chemistry of metals corrosion, systems of archaeological ethics, and the conservation process.

Metals Corrosion

All metal objects corrode in one form or another. Donny L. Hamilton (1997) provided detailed discussions of metals corrosion. While we summarize Hamilton's work here, other detailed treatments can be found in North (1987), Rodgers (1992, 2004), and Cronyn (1990). On the atomic level, metal molecules are held together through metallic bonds. Metallic bonds enable electrons to be shared by all atoms. Corrosion occurs upon the transfer of electrical charge, which causes the ionization of these metallic atoms. During ionization, foreign atoms such as oxygen join with the metallic ions through covalent bonds, resulting in corrosive encrustation. Most metals exhibit visual changes as a result: silver corrosion appears as black tarnish, cupreous corrosion forms a green encrustation, and iron breaks down into reddish brown rust. This paper focuses on the breakdown of iron objects and artifacts.

Oxidation is the most common form of iron corrosion, resulting in the formal combination of oxygen with iron.[3] Oxidation is an electrochemical process involving the formal removal of electrons from iron by combining with oxygen. Iron has a negatively potential electromotive force (EMF), providing it a greater tendency to lose electrons and form positive ions. In contrast, copper is a more noble metal with a higher EMF. The physical and chemical integrity of cupreous metals or artifacts will thus be preserved for a longer period of time than ferrous artifacts.

Electron flow is essential for oxidation. The process of

[3]There are several other elements that actively corrode iron, including chlorides. Chlorides are ionized chlorine atoms, and concentrations of these molecules commonly exist in solution in salt water. Chlorides often saturate archaeological artifacts submersed in marine environments. Chlorides react with oxygen in a corrosive reaction similar to that described above. The artifacts recovered by Michigan Tech research teams from most of the West Point Foundry are from a terrestrial environment drained by rain and freshwater runoff. Thus chlorides are not a significant concern above the immediate area of foundry marsh and cove.

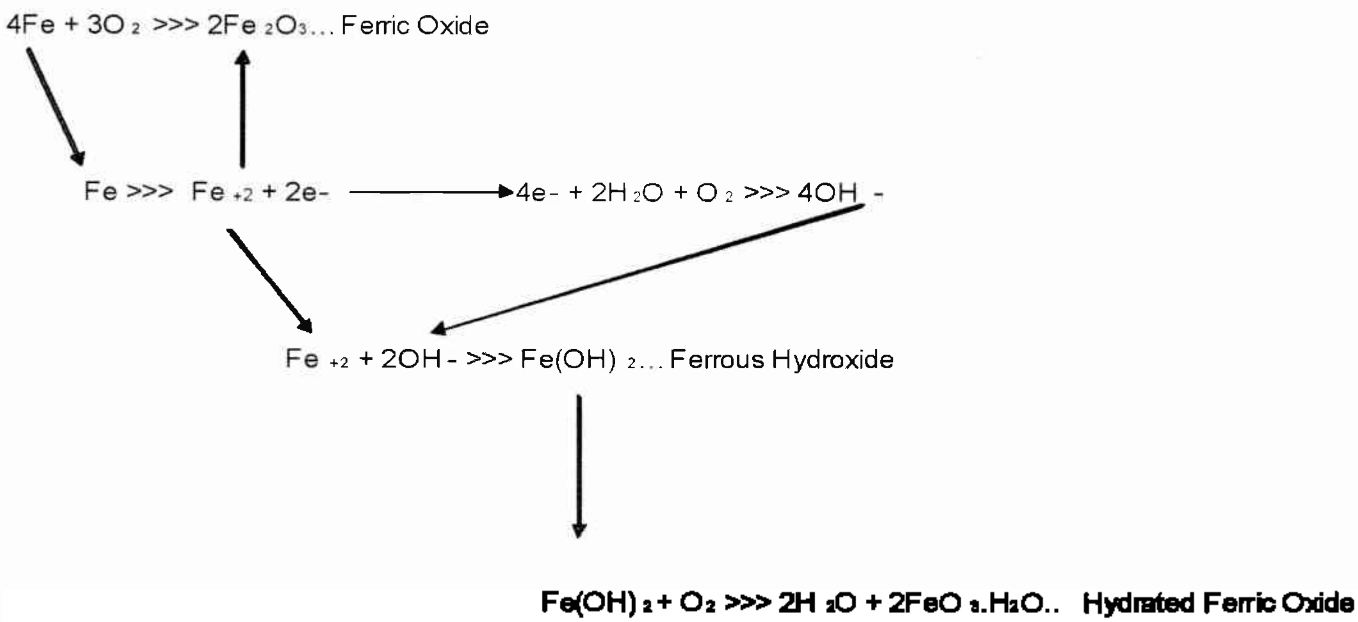

Figure 1. Diagram illustrating the flow of electrons and ions in electrochemical reactions during relevant iron corrosion.

oxidation occurs within a galvanic cell, also known as an electrochemical half cell. Galvanic cells are created when two different metals or different areas of the same metal allow electrons to flow from the positive anodic area to the negative cathodic area. Electrons flow from the anode to the cathode, breaking down the iron atoms at the anode. Oxygen then bonds with the positive iron ions at the anode. This may occur numerous times to produce various types of oxidation. Millions of galvanic cells are present on corroding artifacts. Figure 1 illustrates this process.

The formal oxidation of iron artifacts is facilitated through the presence of electrolytes. Electrolytes are compounds that ionize in water, creating aqueous solutions that conduct electrical current. Acids and salts are powerful electrolytes because they promote the movement of electrons. Conversely, bases are referred to as non-electrolytes because they inhibit the movement of electrical charge. Due to the presence of electrolytes, iron will corrode five times faster in moist soil and ten times faster in seawater than in air alone.

As excavators remove artifacts from their original matrix, they expose the artifacts to a new environment of sunlight, oxygen, and physical handling, and thus can dramatically increase the rate of oxidation. The conservation of ferrous artifacts from archaeological sites therefore presents a significant problem. Iron objects do not stop corroding simply because they are deprived of atmospheric moisture. Archaeological iron includes liquid water that has worked itself into micro-fissures in the iron, often under the corroded patina that encapsulates the object. Simple brushing and air-drying will not remove this moisture.

During the 2004 fieldwork, team members recovered two cast iron pigs from the flowing waters of foundry brook. The workers molded one of the pigs when they tapped a blast two years after the furnace was built, as evidenced by the embossed figures "WPF 1828" (Figure 2, top). After a long period buried in the blast furnace slag heap, a retaining wall collapsed and dropped the pig into the brook. For some undetermined period, the pig lay submerged in the flowing, fresh water. When crewmembers mapped and removed the pig, it appeared to be in essentially pristine condition. Pictured at the top of Figure 2, the bluish-black pig lacked any rust, despite its long submersion. Researchers allowed it to air-dry, tagged it with provenience data, and packed it to be shipped to the lab.

By the time of the assessment of ferrous objects during the following fall term, the pig had begun blooming with orange rust, or more properly, Hydrated Ferric Oxide. The center image in Figure 2 shows the pig in this condition. The clean, flowing water of Foundry Brook had saturated the cast iron ingot with water. The brook also flowed very clean, however, so it lacked good electrolytic properties. While the cascading and flowing water had some dissolved oxygen, the ferrous iron (Fe_{+2}) seemed to have formed into black magnetite (Fe_3O_4) or perhaps green hydrated magnetite ($2Fe_3O_4 \cdot H_2O$). Upon its exposure to atmospheric oxygen, the pig began to corrode until lab staff noticed and arrested its decay nearly three full months later. This meant that the pig underwent many more months of electrolytic cleaning than expected, although in this case we discovered the problem and arrested the electrochemical process before irreparable harm was done to the object. The bottom image

Figure 2. Cast iron pig made at the West Point Foundry's blast furnace in 1828 The top photo recorded the condition of the pig immediately after removal from the fresh running water of Foundry Brook. The middle image shows the pig after oxidation occurred during the period between recovery in the field and conservation treatment in the laboratory. The bottom image illustrates the pig after electrolytic conservation, but before sealing (see footnote 3) This pig was conserved according to the process explained in footnote 2. Archaeologists recovered a second pig from the same area of the brook during the 2007 season. That pig, dated 1829, will require much less time in electrolysis We include this as an illustration of the functionality of the logic of our protocol.

in Figure 2 shows the conserved pig just before it was sealed.

Conditions at the West Point Foundry

Because of the importance of water, oxygen, and electrolytes, researchers reviewed the previous seasons of work, seeking to understand the highly localized conditions in the soils and sediments throughout the valley that might influence the preservation of metallic artifacts. Nature arrests or facilitates the reactions described above, given the presence and absence of certain conditions. Generally speaking, anaerobic and desiccating environments preserve metal well because they reduce contact between oxygen and water and artifacts. The West Point Foundry lacks these environmental conditions. Highly basic environments also inhibit the movement of electrons, but neither are these conditions prevalent at the site. The different trends in metals preservation seem to correlate with the presence of acids and salts in the soil and the level and flow rate of the ground water.

During the 2004 season, excavators noticed that some excavation units produced well-preserved wrought and cast iron artifacts while others yielded highly corroded, unrecognizable, reddish brown lumps. The iron artifacts found at the blast furnace blowing engine were generally well preserved, with details and articulations clearly visible. The boring mill, by comparison, produced prodigious quantities of unidentifiably corroded ferrous nodules. Some of this variation can be explained because the Boring Mill's masses of iron artifacts, particularly the mounded curls of iron lathe waste. In contact with each other in their buried environment, these curls created very effective galvanic cells, making the liberal flow of electrons possible. The varied soils across the foundry site, however, preserved even indi-

Figure 3. View south-by-southwest across the corrugated terrain of the Boring Mill foundations, from the plane and lathe area within an addition to the building. The wheel pit is in the foreground with the arched face of the tailrace temporarily covered by a sheet of plywood. The standing water in the background is the basement under the cannon boring beds. Photograph showing the corrugated terrain of the Boring Mill area at the West Point Foundry Site. Photo taken by Elizabeth Norris on April 9, 2007 and used by permission

vidual iron artifacts differently, and thus require different conservation plans.

The blast furnace and its blowing engine sit high in the ravine, perched on a significant slope just below the middle dam of the waterpower system. The sandy sediment still drains relatively quickly and completely. Conversely, the boring mill complex is constructed on the valley's bottom, at the foot of the western ridge leading to Mount Rascal, and among the foundry's main building cluster. People built the valley floor for the factory; so the ground surface still remains fairly level today. The topography now varies where piles of rubble mark the footprint of each building. The grid arrangement of building walls resulted in piles of rubble bisected by clear linear features, particularly the former rail lines that ran parallel to Foundry Brook (Figure 3).

In the nine decades since the buildings began collapsing, the resultant changes in topography created locations where runoff rainwater pooled and evaporated rather

Figure 4. View looking east-by-southeast from the elevated rail line above the foundry on the valley's western slope. Water is backed up in the Boring Mill after a major storm in October of 2006. While this photo captures an extreme example, these foundations are usually marshy with standing water in the spring. The underground waterpower network would normally drain the Boring Mill.

than running off to Foundry Brook (Figure 4). The rubble dramatically increased this pooling effect when it plugged the underground waterpower network, particularly the open tailrace that returned the blacksmith complex's water back into Foundry Brook. Eroded sediment and rubble has also filled the lower channel of the brook, raising the grade to a point considerably more shallow than that originally constructed by the workers. This higher grade has blocked the outlet of the mill's brick-vaulted tailrace. The obstructions to the water power system trapped rainfall runoff and natural cold springs on the slope above the blacksmith shop complex; this has raised the ground water level and created marshy areas around the blacksmith and boring mill complexes and the terminus of the main rail grade on the valley floor.

The marshy conditions created a poor environment for preserving iron and ferrous artifacts at the boring mill complexes that contrasted quite dramatically with the conditions at the blast furnace area. Field research team members had not systematically studied the soil chemistry at the site, since such data would not address the principal research objectives of the 2003 or 2004 seasons. During Kim Finch's geophysical study of the waterpower network, however, field researchers had systematically measured the electrical resistivity along transects across the boring mill. Resistivity measures the electrical resistance of the body of earth between two electrodes of different potentials. This measure includes the aggregate resistance of the sediment, artifacts, and features: different types of soil, different levels of moisture content, various qualities of salts, and the presence of certain types of artifacts and features, particularly masonry walls, iron rails, clay floors, and dense concentrations of

Table 1. Examples of soil and sediment factors affecting resistivity. These data are adapted from Chauvin Arnoux (2002).

The Effects of Different Characteristics on Sediment Resistivity

Salt Content (measured in Sandy Loam, 15% moisture content by weight, 17° C

Added Salt (% by weight of moisture)	Resistivity (ohm-cm)
0	10.7
0.1	1800
1	460
5	190
10	130
20	100

Moisture content by soil type

Added Moisture (% by weight)	Topsoil	Sandy Loam
0	>109	>109
2.5	250,000	150,000
6	165,000	43,000
10	53,000	18,500
15	19,000	10,500
20	12,000	6,300
30	6,400	4,200

Soil and Sediment type

Type	Minimum	Average	Maximum
Gravel, sand, stones with little clay or loam	59,000	94,000	458,000
Same as below, but with varying proportions of sand and gravel	1,020	15,800	135,000
Clay, shale, gumbo, or loam	340	4,060	16,300
Ashes, cinders, brine, or waste	590	2,370	7,000

small ferrous artifacts (Table 1, also see Finch 2004: 23-26, 50-53).

Finch's survey used both Ground Penetrating Radar (GPR) scans and measurements of Electrical Resistivity (ER). She placed four GPR transect lines over ground outside of the boring mill's eastern stone wall (Figure 5). She hoped to identify the underground path of the brick-vaulted tailrace. Finch's team members also measured resistivity along the first transect in that project area. The measurements of resistivity along those lines provided one mechanism by which researchers could visualize the spatial variation in corrosion-enhancing conditions. Figure 6 shows the areas with approximately 20 ohm/m that encourage corrosion. The moister and more conductive sediments in the middle and northern end of the first transect clearly created such an environment. At the southern end of the transect, where ground level is higher and the topsoil is drier, the soil exerted much greater resistance and thus created an environment less conductive to iron corrosion. These results accurately reflected the initial impressions of excavators who examined the field conditions of excavated finds during 2003 and 2004. Researchers therefore drew the reasonable conclusion that electrical resistivity will be useful in ongoing fieldwork as a general predictor of the decay of subsurface ferrous artifacts.

The Conservation Process

During the fall of 2004, class participants designed an experiment engaging different conservation strategies for ferrous artifacts in MTU's laboratory. We created two principal investigations. The first examined five different treatment strategies to arrest the corrosion of iron artifacts. The second explored the application of electrolytic reduction as a tool for both cast and wrought iron artifacts from the West Point Foundry. The initial stage of the experiments ended in January of 2005 and established conditions for long term monitoring to measure results over a greater time period.

In the first experiment, research team members pulled ten examples of wrought iron machine bolts from the excavated artifacts—five from the boring mill, and five from the blast furnace blowing engine. The five bolts from each area came from a single stratigraphic unit and thus shared a common provenience. All ten bolts were divided into five paired sets, each set containing a single bolt from either area. Researchers dry brushed and air-dried each bolt following the procedures described above.

Following dry brushing and air-drying, researchers varied steps in the conservation procedure for each pair of these bolts. They subjected these five bolts to variations in cleaning, drying, and sealing, as summarized in Table 2. A number of iron artifacts from around the site could be considered controls, since they were processed in the traditional manner and stored according to standard archival practice at Michigan Technological University.

Laboratory staff selected the first two pairs of bolts to assess the minimal investments in cleaning, drying, and sealing against interaction with future moisture. They sealed the first two pairs of bolts following brushing and 24 hours of air-drying. Lab researchers sprayed the first pair with black matte Rustoleum©®™ paint, a fish-oil based commercial product designed to seal iron against atmospheric moisture, which has been shown to work very satisfactorily

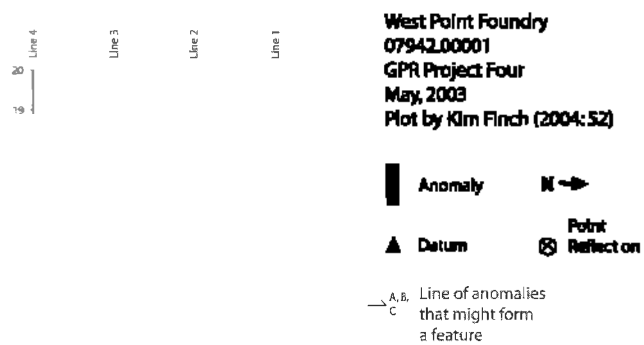

Figure 5. Map of the ground penetrating radar transects established by Kimberly Finch during 2003 field season. The first transect on the reader's right also doubled as a line along which the field crew took electrical resistivity readings. Map and discussion found in Finch (2004: 50-53)

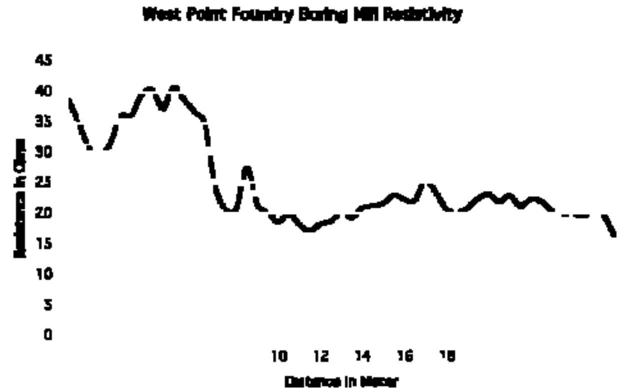

Figure 6. Soil resistivity measured along the Boring Mill in Project 6, Transect 1.

to seal objects for only 10 years (North 1987: 230). In the past, researchers found that Rustoleum's short-term durability seemed outweighed by the great detail visible through the thin, matte finish that would be otherwise obscured by the thick and glossy, but longer-lasting polyurethanes. Rustoleum is only reversible, however, through the application of sodium hydroxide.

The second pair of bolts was then coated with microcrystalline wax. The bolts were submerged for a period of 3 hours in the molten wax in order to drive out residual moisture and oxygen held in micro fissures. Conservators favor microcrystalline wax blends because they are easily applied, resistant to water vapor, and reversible. The wax can also be removed with a bath of boiling water (Hamilton 1997: 4). While these qualities benefit the long term preservation of the artifact, conservators utilize microcrystalline wax consolidants primarily for its aesthetic qualities. Wax provides a strong barrier against further corrosion, but also does not take away from the visual and diagnostic characteristics of the artifact. Through the wax, the true artifact can be viewed, as opposed to a layer of black Rustoleum that obscures the artifact's surface to the researcher. Michigan Tech researchers used a mixture of two different microcrystalline waxes. The blend consisted of two parts B-Square 180 to one part Multiwax 440. This combination was used for several reasons. B-Square 180 is extremely hard, but very brittle. Multiwax 440 is soft, but flexible. By combining the two waxes, researchers hoped to maximize the preservation qualities of each wax.

The third pair of bolts also underwent standard cleaning processes only, but were dried in an oven to drive off that liquid water and then sealed in wax. The fourth pair underwent the same treatment as the third, but lab researchers dehydrated the bolts using acetone immersion before sealing them in wax. By using solvent dehydration, the researchers hoped to reduce the time spent in the drying process.[4]

Table 2. The conservation treatments designed to measure the overall efficacy and cost-effective nature of different conservation treatments for iron artifacts.

2004 Metals Conservation Experiments for the WPF

Bolt Pair	Cleaning	Drying	Sealing
1	Standard dry brushing only	Air drying only	Spray application of Rustoleum©®™
2	Standard dry brushing only	Air drying only	Microcrystalline wax
3	Standard dry brushing only	Oven dried	Microcrystalline wax
4	Standard dry brushing only	Acetone dried	Microcrystalline wax
5	Dry brush with electrolytic reduction cleaning	Oven dried	Microcrystalline wax

The fifth pair of bolts in the experiment received the most intrusive treatment, assessing the usefulness of electrolysis as a tool for the intensive cleaning and conservation of highly significant cast and wrought iron artifacts at from the West Point Foundry. Unlike mechanical cleaning methods that simply remove lumps of hydrated ferric oxide but leave the patina intact, electrolysis, also known as electrolytic reduction reverses the corrosion process. Researchers subjected the bolts to electrolysis, then heat drying, followed by waxing. The formal process of electrolytic reduction is discussed in more detail below.

Lab researchers returned each of the bolts to their primary bags, after completion of photographic and descriptive recording, so that they could be stored with the rest of the artifacts from their provenienced stratigraphic unit. The bolts were bagged individually, however, to prevent scratches that might damage the wax seal against water vapor. While all the treatments initially produced acceptable results, archaeologists will continue to monitor these 10 bolts over the coming years to measure the effects of different conservation strategies.

Electrolysis

Conservators term the first four processes as passive conservation procedures because they do not change the chemical or physical properties of the artifact. Active conservation refers to processes that do change the chemical or physical properties of the artifact in an effort to stabilize structural integrity, aesthetic appearance, and long-term preservation. This can be done through electrochemical, or electrolytic, cleaning. Electrochemical cleaning is a reaction that takes place based upon the association of two metals occupying different positions on the electromotive series of metals without an externally applied electromotive force (EMF). Electrolysis on the other hand requires an externally applied EMF (Hamilton 1997: Chapter 10A). For this experiment researchers were engaged in electrolytic cleaning only.

During electrolysis, the electrochemical process of oxidation is essentially reversed. As a metallic artifact corrodes, the object serves as the anode (+), losing electrons in the process to another metal at the cathode (-). By hooking the artifact into a direct current-powered cell in an electrolytic solution, the object hooked to the negative terminal becomes the cathode (-). As electricity passes through the circuit, water molecules within the electrolytic solution are reduced to their primary elements of oxygen and hydrogen. The hydrogen atoms begin to bubble on the surface of the cathode (the artifact) underneath the encrusted layer of corrosion, and essentially push off this unwanted material. The surface of the artifact is concurrently plated with iron cation molecules liberated from the sacrificial steel mesh at the anode. In short, the electrical current moving through the cell breaks away rust while electroplating the iron artifact's surface with new iron. Figure 7 is a visual description of this chemical process.

The fifth set of wrought iron bolts from the first experiment served as one comparative set. Two additional cast iron objects, one from the blast furnace blowing engine and one from the boring mill, were also conserved via electrolysis. Electrolytic reduction served as an excellent cleaning method for all the objects, and as expected the technique generally restored great detail to the artifacts' articulations. The inherent risks of electrolysis became evident, however, during the treatment of a cast iron plate from the blast furnace blowing engine. Fissures within the iron had permitted corrosion to penetrate clear through the object in one corner. Hydrogen bubbles formed within these cracks, expanded, and fractured the entire corner of the object into disarticulated fragments. Selecting electrolytic reduction as a cleaning technique of choice requires that the lab staff make careful observation and judgment about the overall

[4]In cases where the weight or size of the object makes it impractical to submerge it in liquid wax, the object is rinsed in deionized water, dewatered using a heat gun, and then coated with Minwax© brand polyurethane. The polyurethane is applied in three coats, two coats of satin to seal the metal and a final coat of flat to counteract the shine and glare that would be distracting from the iron artifact itself.

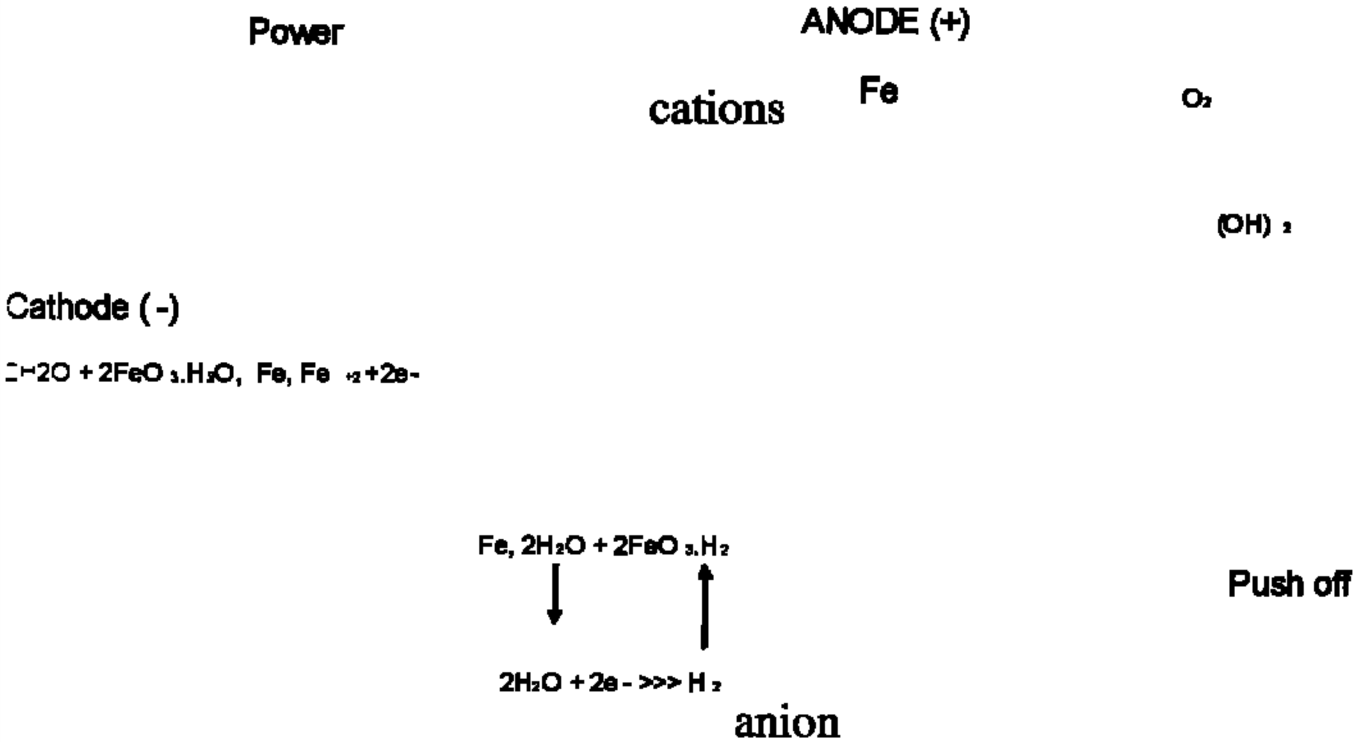

Figure 7. Diagram illustrating the flow of electrons and ions during electrolysis.

integrity of the iron object's core.

The West Point Foundry Ferrous Metals Plan

Based upon the experience of the first two field seasons, the conservation of metal artifacts must begin during fieldwork. From the observations mentioned above, the apparent first step in preserving iron objects across the site must include the restoration of the historically constructed drainage system in the waterpower network. Edward Rutsch made this recommendation nearly twenty-five years ago (1979: [illegible]) and Michigan Tech team members agree with Rutsch's assertion. Such restoration will permit increased throughflows of rain and spring water and will eventually equalize the uneven concentration of moisture and salts on the valley floor.

Mapping the concentration of electrolytes and the resistivity of the soils and sediments across the site will inform ongoing analyses and direct conservation strategies. Deposits in the eastern chambers of the blacksmith shop complex, for example, have been saturated with spring water for at least four decades. While MTU field archaeologists often rely upon magnetic flotation of floor surface soil samples to identify forge or smithing activity area layouts, using hammer scale distribution patterns for example (c.f. Madsen 2002), the chemical conditions in the blacksmith shop complex's eastern chambers make the preservation of such evidence unlikely.

Budgetary and pragmatic concerns constrain further conservation efforts. The research team will never sustain a level of funding where every nail can be coated in microcrystalline wax and each unidentified lump of corrosion can be electrolytically cleaned. Practical concerns require discarding voluminous artifacts, particularly industrial waste and architectural debris. Field team members will measure the volume of large artifact classes, such as slag or lathe waste, before discarding fragments from each screen. They will also continue to employ sampling strategies tailored to each excavation area or deposit type.

As excavators discover significant iron artifacts, however, the researchers now have a plan of action. Every member of the field school research teams understands how to complete a preliminary artifact evaluation. Each excavation team will ask these four questions:

1. Does the study of this object promise significant intellectual benefit beyond simple identification for chronological and typological data? (i.e., Is this significant?)
2. Might an exhibit at the site eventually display this object? (i.e., Is this significant?)
3. Can this object be efficiently dewatered and sealed without electrolytic treatment? (i.e., Is this practical?)

4. Does this object have a substantial metal core remaining that will stand electrolytic cleaning? (i.e., Is this ethical conservation?)

Based upon answers to those questions, the field researchers take actions to conserve each metal object that logically connect to later actions to be taken by other team members in the laboratory.

Electrolytic reduction will remain the research team's preferred method for cleaning and stabilizing ferrous artifacts from the West Point Foundry. While the foundry research team hopes eventually to have an electrolysis tank set up in a field lab for immediate use, during the 2005, 2006, and 2007 and 2008 seasons, excavators took temporary steps to halt the oxidation process on significant artifacts. They rinsed newly discovered objects clean and coated them with an alkali paste. Since highly basic chemicals like sodium carbonate and sodium bicarbonate retard the movement of electrons, the paste halts oxidation by preventing transfer of ions between the cathode and anode. Later in the lab, when more precise work was possible, team members initiated electrolytic reduction under more controlled conditions without having to undo months of successive and preventable damage. Microcrystalline wax remained the preferred sealant, but our ongoing assessments of the experimental bolts will continue to guide our decisions about other potential solutions.

The conservation of ferrous artifacts at Scenic Hudson Land Trust's West Point Foundry Preserve now conforms to a single overarching logic. Participants in archaeological research include: the project directors, graduate student staff, undergraduate students, staff in the field and lab, and field and lab volunteers. We strive to be certain that each participant in the West Point Foundry research project understands how the basic questions asked of a screen full of corroded artifacts connect to the site's analysis, interpretation, and preservation.

Acknowledgements

We would like to thank our research partners, The Scenic Hudson Land Trust, for their continued enthusiasm for the research and interpretation at the West Point Foundry Preserve. We wish to make particular mention of Rita Shaheen, Director of Parks for SHLT, and her efforts. Many people have contributed to the work at the site as research team members, and we particularly wish to thank Elizabeth Norris and Patrick Martin for the thousands of hours they have invested in the project. We have also benefited from the cooperative support of the staff at the Putnam County Historical Society and Foundry School Museum. Susan Martin has helped to coordinate lab efforts at Michigan Technological University, and a number of Michigan Tech undergraduate students have helped with lab work and iron conservation, particularly Jeremy Rahn, Craig Wilson, and David Nelson. John J. Miller, Lab Supervisor for Michigan Tech's Department of Electrical and Computer Engineering, loaned power supplies utilized in the conservation efforts.

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A Lead Object From the Eaton Site

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In 1979, archaeological field school students recovered a small lead object from a 2 m x 2 m excavation unit at the Eaton Site. The object remained in a bag of chert debitage until 1994 when its resemblance to a human incisor was noted. This paper briefly describes the historic components of the site, describes the object, and advances four hypotheses regarding its possible function.

The Eaton Site

The Eaton Site is located in West Seneca, New York on a knoll adjacent to Cazenovia Creek. The senior author directed a total of 17 summer archaeological field schools on the site between 1975 and 2000. Eight of these field schools were for Buffalo State College, three were for SUNY/Buffalo, and six were joint Buffalo State - SUNY/Buffalo field schools. All excavated soil was passed through quarter-inch mesh except for soil samples from features which were subject to more detailed recovery procedures.

The site contains traces of small, intermittently occupied camp sites from the Early Archaic (c. 8000 B.C.) through the Late Woodland (c. A.D. 1200). The major archaeological component is an Iroquoian village dating to approximately A.D. 1550. The Erie were the presumed occupants of the sixteenth-century village. No European material has been found associated with this occupation (Engelbrecht 1991). However, material dating to the nineteenth and twentieth centuries was recovered from the site.

In the mid-seventeenth century the Erie were conquered and absorbed by the Seneca. Over the next hundred years the Seneca utilized the region, though there are few archaeological traces of their presence during this period. During the Revolutionary War, many Five Nations Iroquois were displaced and some resettled along the Buffalo River and its two major tributaries, Cazenovia Creek and Cayuga Creek, the latter named for Cayuga who settled along it. In 1797 the Buffalo Creek Reservation was established, encompassing much of the Buffalo River drainage basin including the Eaton Site.

In 1781 the most numerous inhabitants of the Buffalo Creek Reservation were the Seneca, followed by Cayuga, Onondaga and Delaware (Mt. Pleasant 2007:48). The Onondaga Chief, Big Sky, established a small village about a mile upstream from the site (Houghton 1920:115-116). Houghton (1920:10, 116) states that most houses on the reservation were solitary and located on terraces above the creeks. Such a dispersed settlement pattern fits with what we know of eighteenth-century Iroquois settlement before the American Revolution (Jordan 2008). The knoll on which the Eaton Site is located would have been an ideal location for a cabin and the presence of scattered early nineteenth century domestic refuse suggests that this was in fact the case. However, no trace of such a structure has been found.

Some of the early cabins were built of logs. It is possible that such a cabin was located on an unexcavated portion of the site, adjacent to excavated units. Alternatively, Houghton (1920:10) speculates that even at this late date some house structures may have been constructed of bark. If this were the case at Eaton, it is possible that such a structure was not recognized. Evaluation of this possibility remains a future project.

In a 1997 undergraduate research paper, Kathryn Leacock, with the assistance of Dr. Elizabeth Peña, identified the presence of under glazed transfer printed pearlware manufactured between 1795 and 1840. Thick olive colored glass wine bottle fragments and an early shoe buckle also suggest contemporaneity with the Buffalo Creek Reservation, as do the presence of lead musket balls and gunflints. Also recovered from the plow zone was a Lesslie 2 pence or 1/2 penny token issued by a Toronto druggist and bookstore sometime between 1824 and 1830 (Charlton 1977:30).

Upon the sale of the Buffalo Creek Reservation in 1842, many of the occupants moved to other reservations. In 1843, the area of the site was included in a land purchase by the Community of True Inspiration, a religious group from Germany who founded the settlement of Ebenezer in what is now West Seneca in 1843. All property was held in common. The community soon outgrew its holdings and in 1855 established the village of Amana in Iowa. No mid-nineteenth century material recovered from the site can be definitely linked to this group, but one of their property boundary markers once stood on the site.

With the sale of Ebenezer lands, a property line bisected the site and two farms were established. Farming constituted the major activity on the site during the last half of the nine-

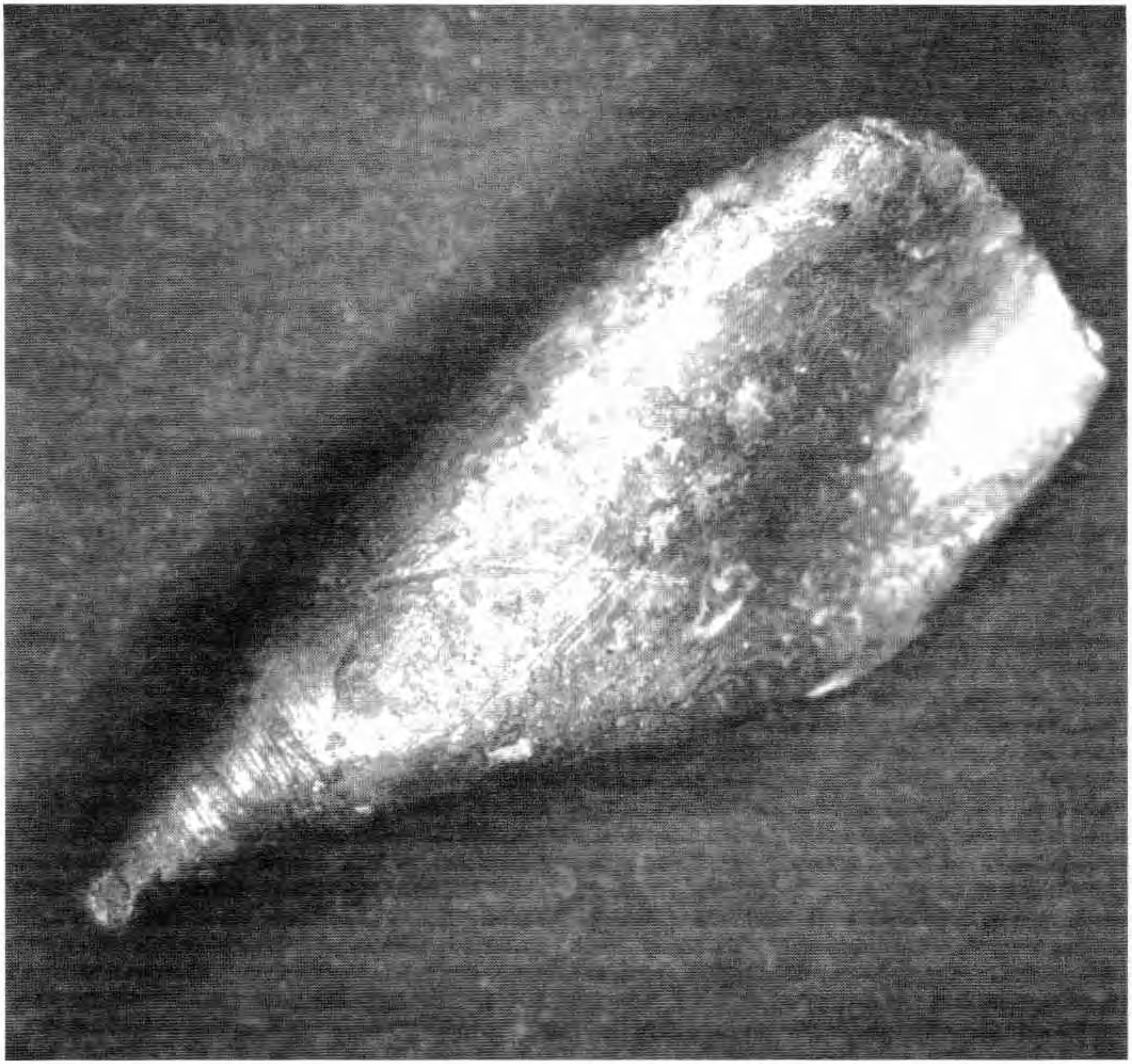

Figure 1. View of the concave face of the object with striations and rust colored material on the surface.

teenth and first half of the twentieth centuries. The vast majority of material recovered from the site, including the prehistoric material, comes from the plow zone resulting from this farming. There is a light scattering of material from the late nineteenth and early twentieth centuries, including a penny from 1904. A concentration of window glass and nails recovered from a few units located near the edge of the knoll may reflect the presence of a small late nineteenth or early twentieth century shed. In an aerial photo from 1951 the site appears as plowed, but farming was discontinued shortly thereafter and vegetation was left to grow on the site. In the late 1960s the northeastern portion of the site was destroyed by a gravel operation. A few years later, more of the eastern portion of the site was destroyed by the construction of a health care facility. When Buffalo State College excavations started in 1975, the remaining portion of the site was covered in thick secondary growth.

Description of the Object

The object resembles a human maxillary central incisor (see Figures 1 and 2). It weighs 7.0 g and has a length of 21 mm.

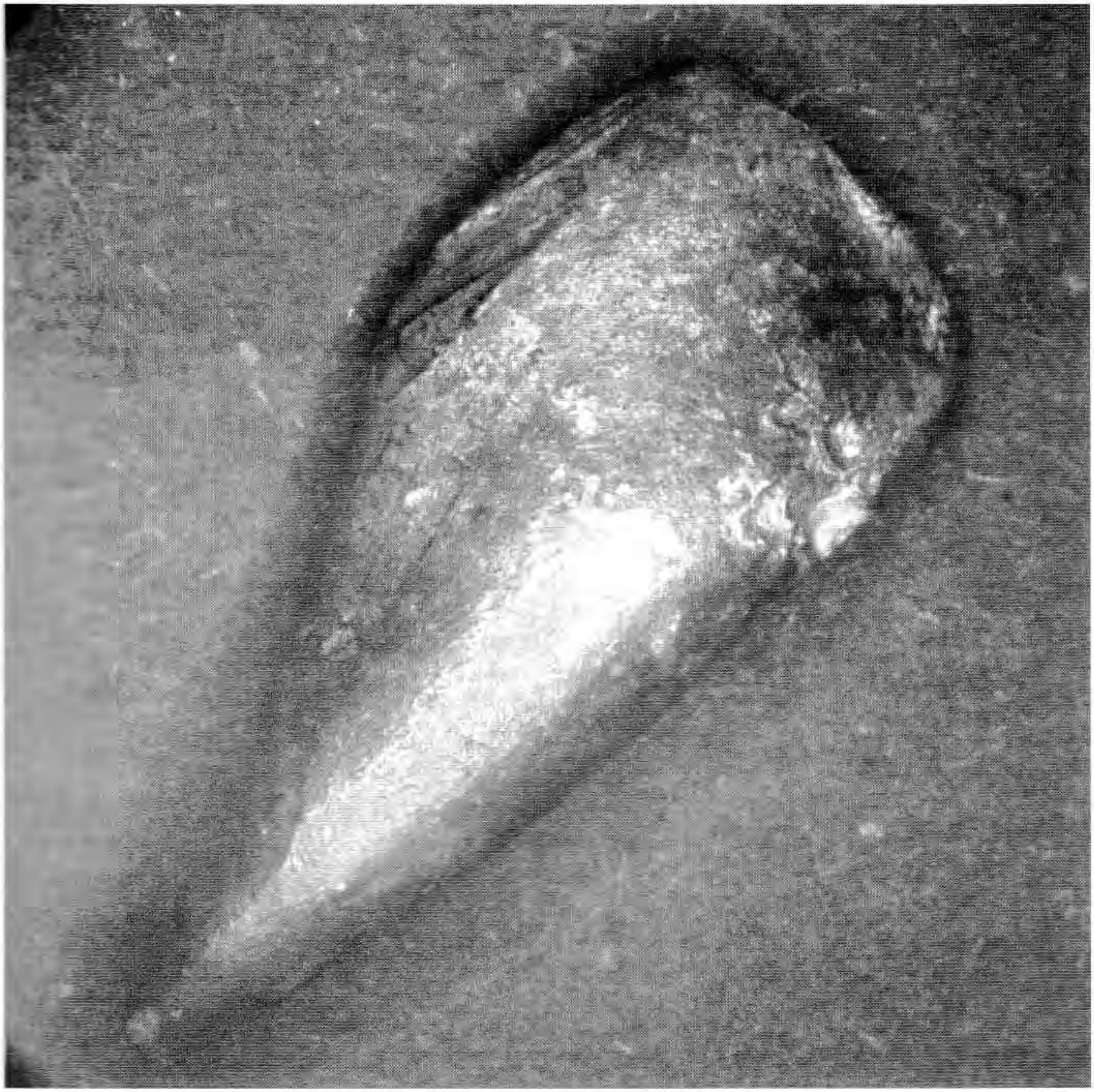

Figure 2. View of the convex face with some pitting.

The maximum width is 9 mm and maximum thickness is 4.5 mm. The object is very dark gray in color (Munsell 2.5YR 3/0). It was recovered in 1979 from a 2 m x 2 m excavation unit, 10S 26W. No more precise provenience is available. It remained in a bag of chert debitage until Oscar Bartochowski, then a graduate student in anthropology at SUNY/Buffalo, examined the debris and recognized its resemblance to a tooth.

The object was partially encrusted with a rust-colored material which contained silicon, phosphorus, calcium, potassium, and iron. This material likely came from the local post depositional environment. There are faint striations partially encircling the pointed end (see Figure 3) and linear striations on the concave surface roughly parallel to the long axis of the object (see Figure 4). These are neither machining marks nor the result of impression in a mold. They are consistent with post-forming surface abrasions. Similarly there is a larger abrasion on the edge of the convex

Figure 3. Close up of striations partially encircling tip Concave view of object

surface. There is also some pitting on this surface. As a tooth shaped object, the area relative to the incisal edge is worn, indicating possible use as a tool. The edge is also rough and uneven, suggesting breakage from some larger piece.

The early nineteenth-century inhabitants of the Buffalo Creek Reservation would have possessed the technical expertise to cast a lead object. The Iroquois were casting their own lead shot by the mid-seventeenth century and lead bars became a desired item in the fur trade (Rumrill 1988:19). Between approximately 1646 and 1659 the Mohawk were also casting various animal shapes out of lead and pewter including turtles, geese, and bears (Rumrill 1988:19-24). Similar figures appear on sites of other Iroquois nations of this period as well. By the late eighteenth century, individuals in many Iroquois communities were producing silver jewelry (Beauchamp 1903:36, 75), so the knowledge of metalworking on reservations by the turn of the nineteenth century was widespread. However, it is unlikely the object was produced from a mold of a tooth as there are no anatomical details of a tooth such as mamelons or CEJ demarcation.

Two historical archaeologists, Elizabeth Peña and Lois

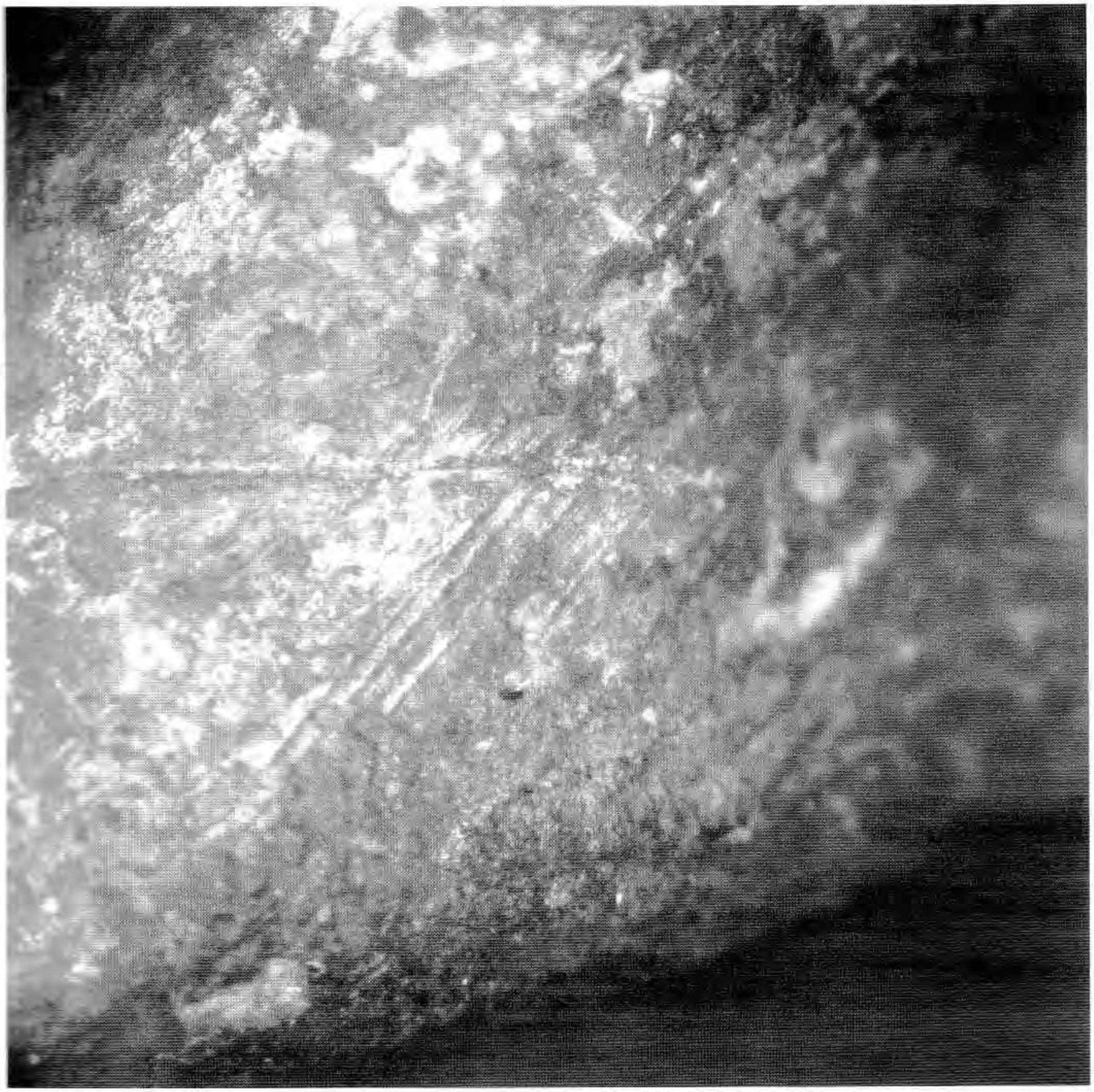

Figure 4. Linear striations on concave surface. The majority are roughly parallel to the long axis of the object.

Feister Huey examined the object and felt that it represented debris from casting lead objects. Since eight pieces of lead shot were also recovered from the site, the chemical signature of these was compared against the tooth-shaped object.

All of the lead items recovered were analyzed using a Niton XLt Field Portable X-ray Fluorescence (PFXRF) unit with a low power (1.0W) Ag anode x-ray tube and a Si PiN detector. The unit was set in alloy mode and sample data was collected for 300 seconds. The machine was calibrated following the manufacturer's recommendations prior to all measurements, and two alloy standards were used to verify instrument accuracy. The lead object has the following composition: 95.2±0.021% lead, 1.8±0.13% antimony, 1.3±0.11% bismuth, 0.16±0.06% tin, 0.7±0.06% iron, 0.05±0.02% copper and 0.04±0.013% zinc (Engelbrecht et al. 2007).

Five of the eight pieces of lead shot have very similar composition to one another: 97.4±0.021% lead, 1.2±0.11%

Table 1. Chemical signatures of lead shot from Eaton.

Element	Five similar lead shot pieces	E292	E 964	E15
Antimony	<LOD	<LOD	<LOD	<LOD
Bismuth	1.2±0.11%	1.5±0.11%	1.1±0.11%	0.9±0.11%
Cobalt	<LOD	<LOD	0.3±0.043%	0.3±0.043%
Copper	<LOD	<LOD	0.06±0.02%	<LOD
Iron	0.5±0.06%	2.6±0.06%	0.8±0.06%	1.6±0.06%
Lead	97.4±0.021%	95.0±0.021%	89.8±0.021%	94.3±0.021%
Manganese	<LOD	<LOD	1.14±0.11%	1.1±0.11%
Palladium	0.04±0.02%	0.07±0.02%	0.05±0.02%	<LOD
Tin	0.16±0.06%	0.2±0.06%	5.4±0.06%	<LOD
Zinc	<LOD	<LOD	0.04±0.013%	0.03±0.013%

bismuth, 0.5±0.06% iron, 0.16±0.06% tin and 0.04±0.02% palladium. Item E292 is the smallest piece of shot, about half the size of other pieces, and has slightly less lead and slightly more iron (Table 1). The remaining two pieces of lead shot are quite dissimilar to the previously described items. Item E964 contains significantly less lead and in addition contains cobalt, copper, manganese and zinc. Item E15 also contains cobalt, manganese and zinc, though copper and tin were below the level of detection (<LOD). None of pieces of lead shot contained significant levels of antimony, which has a detection limit of approximately 0.24%.

The lack of a chemical match between the shot and the tooth-shaped object argues that the object was not a by-product of lead shot production, at least for the shot recovered to date. Further, no lead waste (other than possibly the object under discussion) was recovered from the site despite the fact that all soil was screened. This suggests that lead objects were not produced in the immediate vicinity of the excavations. If the object is a waste product of lead object manufacture, we conclude that it was brought to the site from elsewhere.

Hypotheses Concerning the Object

1. False Tooth

Dr. Glenice Guthrie, a physical anthropologist, examined the tooth in 1994 after it was discovered in the collection and described it as an artificial incisor with a shovel shaped concavity typical of Native Americans. Although there is no direct evidence for the Iroquois using false teeth at this time, the presence of a Seneca living at Buffalo Creek in 1789 with the suggestive name of Gaghkein - "sticking in a tooth," (Lankes 1966:11) suggests the possible use of dental implants.

The object was shown to a number of dentists, including Dr. Gregory Sohrweide of Syracuse, Dr. Malvin Ring of Rochester, and Drs. George Ferry and Ray Miller of the SUNY at Buffalo School of Dental Medicine. Dr. Ferry also circulated photos of the object to colleagues interested in dental history. All dentists agreed that it looked like a tooth, but none felt it functioned as a tooth. Dr. Ring stated that in the late nineteenth century lead dental implants were used, but the roots of these were bulbous to aid in retention in the socket. He noted that this object would have fallen out if placed in a tooth socket after extraction. There is no indication that it was ever attached to any other teeth by gold wire or other means. A number of dentists also noted that the dark color of the object would have been cosmetically unappealing. Drs. Miller and Ring independently concluded that it was formed by chance as a result of casting lead bullets. Despite the fact that the object looks like a tooth we conclude that the object did not function as a tooth.

2. Snowsnake tip

Dolores Elliott, a member of the Triple Cities Chapter, NYSAA, suggested that the object might be the tip of a snowsnake. Snowsnake is a traditional winter Iroquois game in which a spear-like shaft (snowsnake) is hurled down a long trough in the snow. The snowsnake tip is of lead, both to protect the head of the shaft and add momentum. Parker describes the lead tip as being cone shaped (1909b:250). To form the tip, melted lead was "…poured into a cone of paper or rawhide previously wrapped about the nose of the snake…"(Parker 1909b:250). Neither the tip pictured by Parker, nor one illustrated by Beauchamp (1905:259, Plate 31, No.138), appeared to match the lead object under discussion. Further, these cone-shaped objects were deliberately formed to fit a shaft, rather than being the result of splatter. However, it is possible that the object could have served as a lead inlay for a snowsnake tip, as illustrated in Fenton (1978:307). See Figure 5.

While the tip shows abrasion which would be consistent with its use as a snowsnake, there are no linear abrasions emanating from the tip. These would be expected if this

Figure 5. Snowsnake with lead inlay in tip, drawn from a specimen collected in 1903 from the Tuscarora. Total length of specimen is 230.5 cm. Reproduced from *The Handbook of North American Indians*, Vol. 15, p 307, courtesy of the Department of Anthropology, Smithsonian Institution.

...re the tip of a snowsnake. Also, at a weight of 7 g, the ...ect would not have given the snowsnake much weight. ...lly, the tip is not symmetrical. We conclude that its use ... snowsnake tip is possible, but not probable.

... ...oth Effigy

...e Iroquois believed that objects, especially unusual ones, ... power (*orenda*). This power could be used to protect ...ainst or alleviate illness. There are no known examples of ...er human teeth or false teeth being used for this purpose, ... animal teeth were frequently worn both as decorative ...ts and as charms. For example, bear teeth were said to ...ng riches to the wearer (Thomas 1994:32). Regarding ...ection against toothache, Lafitau (1977:35) stated that a ... Iroquois women had tattoos of "...a little branch of ...age" along their jaws either as a prevention or cure for ...thache.

Typically, when there is fear of witchcraft, people hide ... parings, hair clippings or teeth that have fallen out, lest ...ey fall into the wrong hands and be used in spells. ...nceivably, the object in question could have been used ... sinister intent, especially considering that its dark color ...sembles a bad tooth.

Finally, a tooth effigy such as this could have functioned ... a dream token. Dreams and their interpretation were ...portant to the Iroquois. If an individual dreamed of some...ing that he feared, he might be given a symbolic token as ... way of alleviating that fear (Wallace 1972:59-75). I know ... no recorded example pertaining to teeth, but a concern ...th health was an important theme of Iroquois dreams. ...us, it could be imagined that if one dreamed of a bad ...th, then he might be given a replica of a bad tooth and ... that he need no longer fear this.

... Tooth from a False Face Mask

...m Elliott, attending the senior author's talk to the Triple ...ies Chapter with his wife, Dolores, suggested that the holes in masks and are in collections of the RMSC as well. If the lead object were set in the mouth of a mask, it is possible that it was both pushed and twisted during the process. It is not clear whether this would have created the faint circular striations on the "root" and the abrasion on the tip of the "root."

Since there are few extant masks from the early nineteenth century, it is impossible to assess the degree to which they may have varied between Iroquois nations. In 1743 John Bartram described a mask at Onondaga as having a "...mouth set awry, furnished with long teeth" (Fenton 1987:78). Ritzenthaler notes that metal teeth are common in Onondaga masks (1969:29). This is suggestive of continuity in dental imagery in Onondaga masks. As mentioned previously, there was an Onondaga village on the Buffalo Creek Reservation about a mile from the site. Given the dispersed nature of settlement on Buffalo Creek, the most likely inhabitants of a cabin on the site would have been Onondaga.

The idea of masks with inset teeth may have been borrowed by neighboring Seneca at Buffalo Creek. In discussing masks with flaring mouth and visible teeth, Fenton quotes Chauncey Johnny John that this type "...is old at Cattaraugus where it came with the Senecas from Buffalo Creek Reservation" (1987:231). While no illustration or descriptions of a mask with lead teeth was discovered, traditional masks evidence both artistic innovation and creativity as reflected by the variety of materials used to represent teeth. A diseased looking tooth would have added to the frightening appearance of a mask. While we cannot prove that the object functioned in this manner, it remains a possibility.

Conclusion

It appears that the lead object was formed by chance as a by-product of casting a lead object. The absence of other lead debris on the site and the difference in chemical composition between this object and the lead shot recovered from the site suggests that the object was not formed on the site, but rather was brought to the site.

The presence of domestic refuse on the site dating to the early nineteenth century suggests that there was a habitation located near the excavations that remains to be identified. Such a structure would date to the period of the Buffalo Creek Reservation. An historic plaque on Seneca Street about a mile away marks the location of an Onondaga village of this period. The association of the object with the Buffalo Creek period of occupation seems most likely. During the latter part of the nineteenth and first half of the twentieth century the site was farmed and archaeological material from this period is limited.

While it resembles a human incisor, according to the evidence available, the object did not function as such. It is possible that it functioned as the tip of a snowsnake, but the slightly asymmetrical shape of the tip, the lack of linear striations emanating from the tip, and its light weight argue against this.

It seems most likely that the object was brought to the site because of its resemblance to a human tooth. Whether the object then functioned in witchcraft or as a charm, dream token, or tooth in a False Face mask cannot now be determined. It appears to be a unique object. It is hoped that this article will elicit further examples for comparative purposes.

Acknowledgements

Oscar Bartochowski deserves credit for initially identifying the object in the collection and taking it to the SUNY at Buffalo Dental School for professional assessment. Thanks go to Dr. Glenice Guthrie, physical anthropologist, and Dr. Charles Miller, archaeologist, for initially examining the piece. We are indebted to Drs. Gregory Sohrweide, Malvin Ring, and George Ferry for offering their advice as dentists. Dr. Elizabeth Peña and Lois Feister Huey examined the object in their capacity as historic archaeologists. The senior author described the object in a talk to the Triple Cities Chapter of the New York State Archaeological Association, September, 2008. After the talk, Dolores and Tom Elliott provided the suggestions that the object was used in a snowsnake or in a mask. These suggestions were then incorporated into a talk presented at the Annual Conference on Iroquois Research, October 4, 2008, Rensselaerville, New York. Dolores Elliott also read and commented on an early version of this paper. Finally, thanks go to Dr. Beryl Rosenthal for her guidance on the literature on masks.

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Poorly Drained Soils and Aboriginal Archaeological Sites in Eastern New York

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Areas of poorly drained soils are compared to the disposition of aboriginal archaeological sites in two sample areas of eastern New York State with GIS software. A correlation was found between site location and poorly drained soils. These soil types are considered to be former marshlands that were drained by nineteenth and early twentieth century farmers and are now poorly drained farmland.

Introduction

Archaeologists conducting investigations in a cultural resource management context commonly list the soil types that lie within their designated project area. These data are crucial to formulating a testing strategy that will adequately sample the terrain for the presence of archaeological sites. If alluvial soils are expected, it is often necessary to supplement shovel tests with deeper probes that will sample potentially buried former surfaces. Sand can obscure sites that have been buried beneath wind-driven soils formed into dunes.

Soil types have also been used to infer the relative archaeological sensitivity of the local environment and to predict the type of site that may be found. Upland locations of well-drained soils are often thought to be prime locations for camp sites, while alluvial river valleys can contain horticultural village sites of the Woodland period. Terraces overlooking streams and existing water bodies often bear a variety of site types and are commonly viewed as prime locations. Exposed bedrock areas can produce aboriginal quarries, if appropriate minerals are available near the outcrop surface.

Marshlands and the areas surrounding them will produce resource extraction/processing sites. A wide variety of animal and vegetal resources were exploited by precontact Native American groups from marshlands. However, the identification of such marshlands often relies on data reflected in our present day wetlands inventory, as tabulated by federal and state agencies. If none are identified within or adjacent to the sample area, it is inferred by some investigators that no such wetlands were present during the aboriginal occupation era either. This is not necessarily the case.

A preliminary analysis of the disposition of sites in two areas of New York State, as compared to their soil drainage classifications is presented here. Areas of poorly drained soils are hypothesized to be former marshlands. There is a correlation between the number of reported sites and such poorly drained areas. Rather than thinking of them as marginal, areas of poor drainage are prime site locations.

Methodology

Present-day wetland mapping is only telling half the story. Since the mid-nineteenth century more than 50% of wetlands in the United States have been lost due to agricultural draining and urban/suburban development. Numerous nineteenth- and early twentieth- century publications explain in detail how to drain land (Ayres 1928, French 1859, Hays 1910, Munn 1860). Nearly all general farming manuals of the period also include chapters advocating the reclamation of bogs and marshes and describe methods to accomplish this task and put the land to agricultural use. Perfect drainage could seldom be achieved, but if only the top two feet of land could be made somewhat dry, farming could be conducted. Peat was mined extensively in some areas of the lower Hudson Valley as well (Cameron 1970:29-30). Thus, areas of poor drainage are hypothesized to be former marshland that is today simply wet farmland.

In order to clarify the relationship between sites, present day wetlands and known soils of poor drainage, GIS data from the United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS), New York State Department of Environmental Conservation (NYSDEC), and the State Historic Preservation Office (SHPO) were examined using Manifold Systems, a GIS software.

The known wetlands from NYSDEC were plotted. The digital soil map from NRCS was downloaded and plotted as well. All soil types that were described as "very poorly," "poorly," and "somewhat poorly" drained were identified and extracted from the database. These were then plotted as a separate layer, a map of poorly drained soils within the study locations.

Two areas were chosen. A randomly selected 148 sq km location in Columbia County, New York and the Round Lake 7.5 ' quadrangle in Saratoga County were both examined for a relationship between NRCS poorly drained soils,

Figure 1. Round Lake Quad sites, poorly drained soils, and water (NRCS, NYSDEC. NYSHPO GIS data files)

DEC wetlands, and archaeological sites. The State Historic Preservation Office inventory of archaeological sites was consulted and the aboriginal sites in both areas were plotted as a separate layer.

It was found that in nearly all locations on both maps, NRCS soils of poor drainage coincided almost exactly with the DEC wetlands, but they also extended considerably beyond the present-day disposition of the DEC wetlands. When compared, the poorly drained areas represent an additional 50% (approximate) of terrain beyond legally-defined wetlands. Today, they are considered simply poorly drained farmlands. It is thought, however, that they are, in fact, former marshlands that were drained by farmers during the nineteenth and early twentieth centuries.

If these areas are identified as former marshland, then they could have once been areas of prime habitat for animals and plants that were utilized as resources by Native Americans for millennia. Lands of poor drainage examined by CRM investigators and others might then be considered as highly sensitive for the presence of aboriginal sites.

Round Lake Quad

Figure 1 indicates the Round Lake quadrangle in Saratoga County. The areas of poorly drained soils, existing waterways, and known archaeological sites are shown. It can be seen that there is a strong correspondence between poorly drained soils and archaeological sites. They are largely clustered in the northwest and east central portions of the map.

The soil layer is an amalgam of numerous poorly drained types. Below are listed all such soils that exist in Saratoga County, New York. The prefix denotes the standard abbreviation used by the NRCS in both its printed soil maps and the digital versions. Most of these types are found on the Round Lake quadrangle.

As - Allis silt loam
BxB - Burdett silt loam
Cg - Cheektowaga mucky very fine sandy loam
Cs - Cosad fine sandy loam
Fl - Fluvaqvents frequently flooded
FU - Fluvaquents-Udipsamments complex, flooded
In - Ilion silt loam
Lm - Limerick-saco complex
LY - Lyme fine sandy loam, very stony
Ma - Madalin mucky silty clay loam
Ms - Massena silt loam
MvA - Mosherville silt loam, 0 to 3 percent slopes
MvB - Mosherville silt loam, 3 to 8 percent slopes
MxB - Mosherville-Hornell complex, undulating
Ne - Newstead loam
Pm - Palms muck
Pp - Palms muck, ponded
Ra - Raynham silt loam
RhA - Rhinebeck silt loam. 0 to 3 percent slopes
RhB - Rhinebeck silt loam. 3 to 8 percent slopes
Sa - Scarboro mucky loamy sand
Sh - Shaker very fine sandy loam
Sn - Sun silt loam
Wa - Wareham loamy sand
WO - Wonsqueak muck. ponded

Of the 52 aboriginal sites on the quadrangle, seven are found 350-400 m from areas of poor drainage. The remaining 45 are found within or immediately adjacent to such areas. Therefore, 87% of the sites on the Round Lake quad are associated with poorly drained soils. The rest are peripheral, but probably associated with resource extraction or processing in those dry locations. Although a more fine grained examination of the relationship between the various drainage classifications and site dispositions was not attempted, note that five sites in the study area were located within areas of Palms Muck, one of the most poorly drained soils within the study area.

Eutrophication of lakes is a well-documented phenomenon that describes changes that occur in water bodies (Siegfried 1986:18). Open water ponds and post-glacial meltwater lakes eventually decreased in extent and depth, becoming shallower until they evolved into wetland marshes. In addition, changes in climate have caused both increase and decrease in the limits of such wetlands. Aboriginal groups are known to have utilized such areas. There are dozens of wetland types in existence today, as there no doubt were in antiquity. Ultimately, many of these areas were drained for farming due to the high amount of rich, organic material present. Absent the excess water, they are organically rich soils of a wet nature.

Columbia County Study Area

A 148 sq km area in western Columbia County was examined using the same methodology. The study area is today rolling farmland and upland forest (Figure 2). Of the 70 sites on this map, 27 are found 250-300 m from a poorly drained soil. The remainder lie within or immediately adjacent to such soil types. I could find no outliers. All of the sites in this study area appear to be associated with poorly drained soils. As with the Round Lake quadrangle, the existing DEC wetlands (not shown) overlap almost completely with NRCS poor drainage soil types, but the poor drainage types extend directly from such areas and make up an additional 50% (approximate) of terrain beyond the NYSDEC wetlands. They are considered, therefore, to be former wetland marshes that were drained to create farmland. Going beyond the study area, it should be noted that more than a dozen sites in all of Columbia County are located within areas of soil classified as Very Poor and Poor drainage.

Earlier research in southeastern New York found that 53% of 224 reported archeological sites were within or adjacent to a NYSDEC wetland. A strong preference for the larger wetlands was apparent. The preference for such locations spanned all periods of Native American habitation. This preference was attributed to the larger amounts of wildlife and edible plants found in such areas (Funk 1990). If poorly drained soils are considered as former wetlands, the percentage rises significantly as seen in the GIS modeling included here.

Figure 2. Columbia County study area, sites, poorly drained areas, and water (NRCS, NYSDEC, NYSHPO GIS data files).

Discussion

Wetland as presently understood is not simply "wet land." There are nearly 50 varieties of wetland environments known in New York State (Edinger et al. 2002, Reschke 1990). The natural environment and potential subsistence resources that these locations offer vary considerably. Many are only found in specific terrains and environments. All contain unique assortments of plant and animal life, and not all may have offered useful resources to hunter-gatherers in all wetland types.

However, they are simply called "wetlands" for permit compliance purposes when such mapped areas are threatened with development and negotiation with NYSDEC is required. Wetlands are delineated by private firms that are themselves often a separate division of the architectural firm. It is unknown how accurate such delineations actually are. The author has seen numerous delineations that were considerably smaller than the actual wetland present.

Great efforts are made by state and federal agencies to preserve these natural habitats, but former wetlands that were drained by the first wave of settlers and subsequent farmland expansion remain unprotected and unmapped since they no longer qualify. The only documentation the archaeologist may have today of a former wetland is the presence of poorly drained soils which often lie contiguous to legally-defined wetlands. Many of the late nineteenth- and early twentieth-century USGS maps indicate marshes, many of which were later drained and are no longer protected. A few wetlands were also unintentionally created during the historic period by impoundments and road construction.

Most developers alter their construction layout to avoid legally-defined wetlands, thus they remain unexamined by archaeologists because there will be no impact. Poorly drained soils are often excluded from archaeological surveys as well because it is thought by some that no sites are likely to occur. Yet numerous sites have been located in such areas as seen in this GIS study. These sites do occur in and near bogs, peat lands and poorly drained soils in New York and elsewhere regardless of their legal status

A prehistoric activity in any particular region that was not associated with food procurement can skew the results of GIS modeling. The two study areas were chosen because each showed a paucity of lithic procurement sites. An informal examination of site distributions in eastern Greene County was also performed with little correlation seen between site location and poor drainage. This county is rife with aboriginal chert quarries and associated lithic processing sites. Clarification may be possible in such cases by adding a bedrock geology layer to the modeling sequence and examining the relationship between sites and outcrops of useful lithic materials.

Conclusions

Understanding the implications of soil types is crucial to both the planning of an archaeological survey and understanding the context within which an archaeological site is found. This simplistic paleo-environmental reconstruction has found a strong correlation between poorly drained soils and the presence of aboriginal archaeological sites in two areas of eastern New York State. The author considers that such areas and their immediate surroundings should be viewed as highly sensitive for Native American archaeological sites associated with resource extraction and processing of animal and vegetal substances.

Sampling of such areas can be problematic. Traditionally, poorly drained areas have been considered marginal and thus given only a cursory examination. It has been assumed that only dry, elevated locations would contain sites due to their obvious comfort value. Nevertheless, poorly drained areas are often known to contain many sites. The Hiscock Site in Genesee County lies within a bog area and is arguably one of the most significant Paleo-Indian sites in the state (Laub et al. 1996). The Paleo-Indian Dutchess Quarry Cave site lies near a drained bog (Guilday 1969:24). Woodland period sites also lie within The Rye Marsh area of Westchester County (Lavin and Morse 1985:13-25). The early seventeenth-century Dutch Hollow Site in Livingston County lies adjacent to the previously drained South Lima Swamp (Ritchie 1954). The Middle Woodland McCullough Earthwork Site lies within a swamp in Chautauqua County on a rise only three feet above the wet earth and bog (Guthe 1958). The widely known Lamoka Lake site was found to extend onto peat land and below the water table in a subsequent investigation (Gramly 1983).

Thus, a reliance on legally-defined wetland delineations in the formulation of archaeologically sensitive areas is seriously flawed. Only the still extant wetlands whose borders are of uncertain disposition are described . Sites that once stood a few feet above marsh may now be submerged. Conversely, sites that were once within a wetland may now be found some distance from its present margins. If we are to understand the archaeological record, the resource value of wet terrains must be considered, regardless of their legal status.

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In Memoriam

Stanley H. Wisniewski (1918-2008)

New York archaeology lost one of its staunchest supporters, with the death of Stanley Wisniewski. He died of natural causes. He was born in Brooklyn (Greenpoint). His wife of 57 years, Margaret, survives him. His interest in local archaeology began in 1933. His boyhood friend, Ralph Solecki, also then resident of Maspeth, Queens, initiated him into the study. Stanley participated with Solecki in a number of field explorations on western Long Island, and undertook many investigations on his own. He compiled a catalog of his finds, documenting them carefully in his journals.

During World War II, Stan entered the Signal Corps, then noting that there were openings in the Air Force got his transfer. He became a gunner-armorer on a B-26 attack bomber, the Martin Marauder, of the 319th Bomber Group. He chalked up 65 missions, a phenomenal number. After his return home, he embarked on a career of draftsman of engineering drawings. From 1945 to 1950, he attended evening courses at New York University in the Division of General Education in Engineering Subjects. At the same time, he resumed his avocational interest in archaeology. He joined a small group with similar interests in local archaeology called the New York Archaeology Group (1958-63). They conducted investigations in the Fort Independence Site in Bronx, an American Revolutionary War site. This small group was absorbed in the newly formed Metropolitan Chapter of the New York State Archaeological Association (1962), of which Stan was a founding member. He received a Certificate of Merit from the NYSAA. Wintering at their address in Florida, Stan carried his archaeological interests with him. He and Margaret joined the Southeast Florida Archaeological Society, a chapter of the Florida Anthropological Society. They did volunteer work in the St. Lucie Historical Museum. For recreation, Stanley loved to read books and compose poetry. He also enjoyed painting with oils and watercolors.

Stan published a number of significant contributions to New York archaeology. Among them are:

1958 A Naturally Grooved Boulder on an Archaeological Site in Bayside, Long Island. *Bulletin of the Archaeological Society of Connecticut* 28:30-31 (with Ralph Solecki).

1971 The Ryders Pond Site, Kings County, New York. *The Bulletin*, The New York State Archaeological Association 53:1-21 (with Julius Lopez).

Stanley Wisniewski on the beach at Mount Sinai Harbor (Photo courtesy of Margaret Wisniewski).

1982 The Tiger Lily Site, Mt. Sinai Harbor, N.Y. *The Bulletin and Journal of Archaeology for New York State* 84: 1-17 (with Gretchen Gwynne).

1986 The Bay Terrace Creek Site, *The Bulletin and Journal of Archaeology for New York State* 93: 1-26.

2007 Mt. Sinai Harbor, Suffolk County, Long Island, New York: An Overview of an Archaic Crossroads. *The Chesopeian* 45 (1-2).

In Press *The Archaeology of Maspeth, Long Island , New York and Vicinity*. Researches and Transactions, New York State Archaeological Association (with Ralph Solecki). In this work, Wisniewski and Solecki have detailed their findings and investigations of the prehistoric and historic sites in their earlier hometown.

Stanley will be remembered for his temperate disposition, helpfulness, and wry grin. He will be missed in the archaeological community.

Ralph Stefan Solecki

Charles E. Gillette (1920-2008)

We have lost a highly respected contributor to Northeastern archaeology and the New York State Archaeological Association with the passing of Charles E. Gillette on May 4, 2008 at Hoosick, New York. Born on February 23, 1920 in New Albany, Indiana, Charles completed his undergraduate studies in history at Cornell College in Mt. Vernon, Iowa in 1942. That same year he married his beloved wife Gwyneth. Charlie served in the army during World War II and after being discharged in 1945, he enrolled in graduate school at the University of Chicago. He was awarded the Master's degree in anthropology in 1949.

When Charlie accepted the newly created position of Curator of Anthropology at the New York State Museum in 1950, he and Gwyn moved east to Albany, New York. Over the next 33 years he served faithfully in that job, retiring in 1983. During his early years at the state museum Charlie did double duty, working as Bill Ritchie's archaeological field assistant during the summer months and completing curatorial duties during the rest of the year. However, as the collections expanded over time, he found less opportunity to participate in field work. In addition to traditional curatorial tasks such as accessioning, cataloguing, and conserving the archaeological and ethnological collections, Charlie's duties at the state museum included maintaining the Site Registration system, consulting with various police agencies regarding human osteological finds, and providing technical assistance to visiting scholars utilizing the collections.

Charlie's publications span a 44-year period and include: a site report on the Fisher Site, Will County, Illinois, published in the Illinois State Academy of Science Transactions, Vol. 42 (1949); an obituary of Charles Reuben Keyes, "the father of Iowa archaeology" published in *American Antiquity* (1952); "The People of the Longhouse"—a New York State State Museum gallery guide to the Indian Groups exhibit; a review of Marian White's *Iroquois Cultural History in the Niagara Frontier Area of New York State*, published in the Buffalo Museum of Science Newsletter (1962); "Wampum Belts and Beads" in the *Indian Historian*, (1970); and he co-authored Chapter 6, "Europeans Come to the Upper Susquehanna" in Robert E. Funk's *Archaeological Investigations In The Upper Susquehanna Valley, New York State*, Vol. 1 (1993). He also acted as an advisor for the microfilm publication of "The Papers of the Society of American Indians" by the United States National Museum.

Soon after arriving in Albany in 1950, Charlie and Gwyn joined the Van Epps-Hartley Chapter of the New York State Archaeological Association. The following year he presented his first paper on "The Early Mohawks" at the 1951 NYSAA Annual Meeting. Over the years, Charlie presented half a dozen papers at chapter and state meetings, but his contributions were not limited to academic pursuits. He served on the Van Epps-Hartley Chapter "Sites Committee" from 1952-1957; as chairman of the "Program and Arrangements Committee" for the Annual State Meeting at Albany in 1954; as a member of the chapter "Membership Committee" from 1955-1958; as a chapter trustee from 1954-1965; and as Van Epps-Hartley Treasurer from 1964 through 1981 and again in 1988-1989.

Charles Gillette at a Van Epps-Hartley Chapter meeting c. 1952. Photo courtesy of Wayne Lenig.

On the state level Charlie served as NYSAA Secretary from 1954-1957, NYSAA Treasurer from 1958-1960; NYSAA Vice-President from 1975 to 1981 and again in 1985; and NYSAA President from 1982 to 1983. He was awarded the NYSAA Meritorious Service Award in 1983. Charlie was also active in many other historical and archaeological organizations, including the Society for American Archaeology, the American Association of Physical Anthropologists, the Mohawk-Caughnawaga Museum, and the Iroquois Indian Museum at Howe's Cave, NY, just to name a few.

For those fortunate enough to have known and worked with Charlie he will always be remembered for his dry wit and carefully measured responses to queries. A conversation with Charlie was seldom measured in minutes or hours, it usually encompassed days and sometimes even years. When Charlie finally pronounced his answer to any query you can be sure it was a good one—usually with a unique spin—and always worth the wait.

Charles E. Gillette is survived by his wife Gwyneth, his son David, and his daughter Caroline, wife of Noel Ashton.

Wayne Lenig

NEW YORK STATE ARCHAEOLOGICAL ASSOCIATION

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AURINGER-SEELEY CHAPTER — SARATOGA SPRINGS
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LEWIS HENRY MORGAN CHAPTER — ROCHESTER
INCORPORATED ORANGE COUNTY CHAPTER –MIDDLETOWN
INCORPORATED UPPER SUSQUEHANNA CHAPTER — OTEGO
THOUSAND ISLANDS CHAPTER — PHILADELPHIA
TRIPLE CITIES CHAPTER — BINGHAMTON
VAN EPPS-HARTLEY CHAPTER — FONDA

Minutes of the General Business Meeting
NYSAA 92nd Annual Meeting
Comfort Inn & Suites, North Syracuse, NY
April 18, 2008

Opening:

NYSAA President Bill Engelbrecht called to order the regular meeting of the General Business meeting at 7:30 pm on April 18, 2008 with opening remarks and thanks to the hosting chapters.

Present:

Officers Present:
President, Bill Engelbrecht; *Vice-President*, Sissie Pipes, *Corresponding Secretary*, Bill Bouchard, and *Recording Secretary*, Lori Blair.

Chapter Roll Call:
Present: Adirondack, Auringer-Seelye, William M. Beauchamp, Chenango, Frederick M. Houghton, Finger Lakes, Lewis Henry Morgan, Lower Hudson, Mid-Hudson, Incorporated Orange County, Incorporated Upper Susquehanna, Thousand Islands, Triple Cities, and Van Epps-Hartley.

Absent: Metropolitan and Long Island Chapters.

A. Reports of the Officers

President: Bill Engelbrecht—report on file.

- Lisa Anselmi represented the NYSAA at the annual meeting of the Council of Affiliated Societies held in conjunction with the annual meeting of the Society for American Archaeology.
- Authors can request peer review for submissions to *The Bulletin*: the Table of Contents of the Bulletins will be posted on the web.
- Requests information for the newsletters.
- ESAF meeting is hosted by NYSAA and will be held in Lockport.

Vice-President: Sissie Pipes.

- A new role for the vice-president is to coordinate with hosting chapters of the annual meeting to reduce likelihood of conflict with holidays and other associations' meetings and events.
- This will require some coordination since according to the by-laws, NYSAA is limited to holding the annual meeting within a timeframe of four weekends.
- The v-p is also working on the newsletters and encourages submissions.

Treasurer:—Report on file; presented by Fred Stevens

- Generally, we are doing well—$4,000 more than last year; we have $45,955 in assets.
- Main reason for this increase is jump in memberships.

Corresponding Secretary: Bill Bouchard—report on File.

- Membership is up!

Recording Secretary: Lori Blair—report on file.

- The minutes of the April 2007 General Business meeting were reviewed and approved at the October 2007 Executive Committee Meeting.

- The minutes of the October 2007 Executive Committee Meeting were reviewed and approved.

➢**Motion made by Fred Assmus to accept the minutes as written, 2nd by Vicky Jayne. Passed.**

B. Report of the Committees

Awards and Fellowships—Peter Pratt

- The Awards and Fellowships committee has met and awards will be presented at the banquet on Saturday evening.

Chapters and Membership—Sherene Baugher, Chair

- Sherene spoke with the various chapters and the following suggestions were made about how to increase membership:
- A chapter needs a good location for meetings. The venue should have handicap accessibility.
- Adopt a consistent and reliable schedule for meetings and events.
- Vary speakers from throughout the state and the local community.
- Reach out to the CRM community, and to students.
- Brochures are available to chapters for distribution.

Publications—Charles Hayes - —report on file

- *Bulletin 2006* (No. 122) has been distributed.
- *Bulletin 2007* (No. 123) is about to come out in May or June.
- Need submissions for No. 124—contact Charles or Martha Sempowski; peer review is available.

Research and Transactions report is on file.

- Bill Engelbrecht said there may be a cost differential for members and a change to by-laws because it precluded producing the R&T.

Finance—Fred Stevens—report on file

PROGRAM FOR 2009—Martha Sempowski—Morgan Chapter

The 93rd NYSAA annual meeting will be hosted by the Morgan Chapter; the program is in the early stages and the venue has not been selected. Presently there is no date but the chapter is considering April 17-19th because there are no conflicts.

Special Appointees

ESAF Liaison—Tim Abel

- The 74th annual meeting was November 8-11, 2007, in Burlington, Vt., and was hosted by the Vermont Archaeological Society.
- ESAF membership is dwindling.
- The 75th meeting is in Lockport—see ESAF website for information.

NYAC Liaison—Sissie Pipes

- The archaeology season posters are available; Nina Versaggi and staff put it together.
- Sissie reminded the membership that archaeology season should be a joint effort of NYSAA and NYAC and encourages NYSAA chapters to collaborate.

Funk Foundation - Wayne Lenig

- There has been one meeting since last year.
- There was one professional application - the foundation requested more information but hasn't heard back yet.
- So - no money has been distributed; available funding is $9300.
- Two new student applications (Buffalo and Binghamton).
- Levels for grants are professional, avocational and students; there was a discussion at the last meeting to do away with distinction of submissions.

Society for Pennsylvania Archaeology—Fred Assmus

- The meeting was held two weeks ago; slightly over 100 attended.
- Next year's meeting (the 90th is during the 1st week in April at the state museum in Harrisburg.
- SPA is hosting ESAF in 2009.

ASPI—Ann Morton

- Prepared three or four letters.
- Updated the brochure in 2007 and will be updating the 2008 brochure.
- About 400 brochures are distributed annually, many to summer field schools and summer camps.

OLD BUSINESS

Elections—Martha Sempowski

- Ballots were counted by Martha and Dale Knapp. The results:

President: Bill Engelbrecht
Vice-President: Sissie Pipes
Treasurer: Carolyn Weatherwax
Corresponding Secretary: Bill Bouchard
Recording Secretary: Lori J. Blair

NEW BUSINESS

- The By-laws currently read "The Association shall hold at least one annual meeting during the period April 15th to May 15th and such other regular meetings as shall be determined by the Program Committee with the consent of the Executive Committee." It was suggested to change April 15 to May 15 to April 1 to May 15.

➢Motion by Fred Assmus to adopt and ratify the change, 2nd by Gerald Hayes. Passed.

- Wayne Lenig stated that the Van-Epps Hartley chapter is interested in hosting the 2011 meetings in Johnstown, NY.

➢Motion by Fred Assmus to donate $300 to the Funk Foundation, 2nd by Delores Elliot and Fran McCashion. Passed.

➢Motion by Scott Stull to donate $300 to the Chuck Fisher Foundation, 2nd by Barbara De Angelo. Passed.

➢Motion by Sherene Baugher to adjourn, 2nd by Mike Cinquino. Passed.

The meeting adjourned at 8:30 pm.

Respectfully submitted, Lori J. Blair,
NYSAA Recording Secretary

Past and Present NYSAA Award Recipients

The Achievement Award

- • Charles M. Knoll (1958)
- • Louis A. Brennan (1960)
- • William A. Ritchie (1962)
- • Donald M. Lenig (1963)
- • Thomas Grassmann O.F.M. (1970)
- Paul L. Weinman (1971)
- • Robert E. Funk (1977, 1994)
- Peter P. Pratt (1980)
- • Herbert C. Kraft (1989)
- Lorraine P. Saunders (1999)
- Martha L. Sempowski (1999)
- William E. Engelbrecht (2004)
- Edward J. Kaeser (2006)

Theodore Whitney Commendation

- Gordon C. DeAngelo (1998)
- Charles F. Hayes III (1999)

Fellows of the Association

- Sherene Baugher
- Monte Bennett
- James W. Bradley
- • Louis A. Brennan
- • William S. Cornwell
- Gordon DeAngelo
- Dolores N. Elliott
- William E. Engelbrecht
- Lois M. Feister
- Stuart J. Fiedel
- • Charles L. Fisher
- • Robert E. Funk
- • Thomas Grassmann O.F.M.
- • Alfred K. Guthe
- • Gilbert W. Hagerty
- Charles F. Hayes III
- Franklin J. Hesse
- John D. Holland
- • Richard E. Hosbach
- Paul R. Huey
- • R. Arthur Johnson
- Edward J. Kaeser
- • Herbert C. Kraft
- • Roy Latham
- Lucianne Lavin
- • Donald J. Lenig
- Wayne Lenig
- Edward J. Lenik
- • Julius Lopez
- Ellis E. McDowell-Loudan
- • Richard L. McCarthy
- Mary Ann Niemczycki
- • James F. Pendergast
- Peter P. Pratt
- Robert Ricklis
- • William A. Ritchie
- Bruce E. Rippeteau
- • Donald A. Rumrill
- • Bert Salwen
- Lorraine P. Saunders
- • Harold Secor
- Martha L. Sempowski
- Dean R. Snow
- David R. Starbuck
- David W. Steadman
- • Audrey J. Sublett
- James A. Tuck
- Stanley G. Vanderlaan
- Paul L. Weinman
- Thomas P. Weinman
- • Marian E. White
- • Theodore Whitney
- Anthony Wonderley
- • Charles F. Wray
- • Gordon K. Wright

Certificate of Merit

- Tim Abel
- Thomas Amorosi
- Roger Ashton
- Charles A. Bello
- Monte Bennett
- Daniel M. Barber
- Malcolm Booth
- James W. Bradley
- • Ralph Brown
- Art Carver
- • William Davis
- Gordon De Angelo
- Robert DeOrio
- Harold R. Decker
- Elizabeth M. Dumont
- Lewis Dumont
- • William F. Ehlers
- Dolores N. Elliott
- Garry A. Elliot
- Lois M. Feister
- John Ferguson
- • Robert E. Funk
- Joan H. Geismar
- • Stanford J. Gibson
- Gwyneth Gillette
- Robert J. Gorall
- R. Michael Gramly
- George R. Hamell
- Elaine Herold
- Franklin J. Hesse
- • Richard E. Hosbach
- Paul R. Huey
- Vicky B. Jayne
- Dale Knapp
- Albert D. La France
- • Kingston Larner
- John R. Lee CSB
- Edward J. Lenik
- William D. Lipe
- Kelly Lounsberry
- Adrian O. Mandzy
- • John H. McCashion
- Ellis E. McDowell-Loudan
- Dawn McMahon
- Jay McMahon
- Ann Morton
- Brian L. Nagel
- Robert Navias
- Annette Nohe
- • Alton J. Parker
- Marie-Lorraine Pipes
- Marjorie K. Pratt
- Peter P. Pratt
- Louis Raymond
- Beulah Rice
- • William H. Rice
- Saul Ritterman
- Lucy Sanders
- William Sandy
- Barbara Sciully
- William E. Scott
- • Harold Secor
- Annette Silver
- Gregory Sohrweide
- Mead Stapler
- David W. Steadman
- Marilyn C. Stewart
- Kevin Storms
- Tyree Tanner
- Donald Thompson
- Neal L. Trubowitz
- Justin A. Tubiolo
- George Van Sickle
- Charles E. Vandrei
- James P. Walsh
- George R. Walters
- Alvin Wanzer
- • Beth Wellman
- • Henry P. Wemple
- Roberta Wingerson
- • Stanley H. Wisniewski

• known deceased