

THE BULLETIN

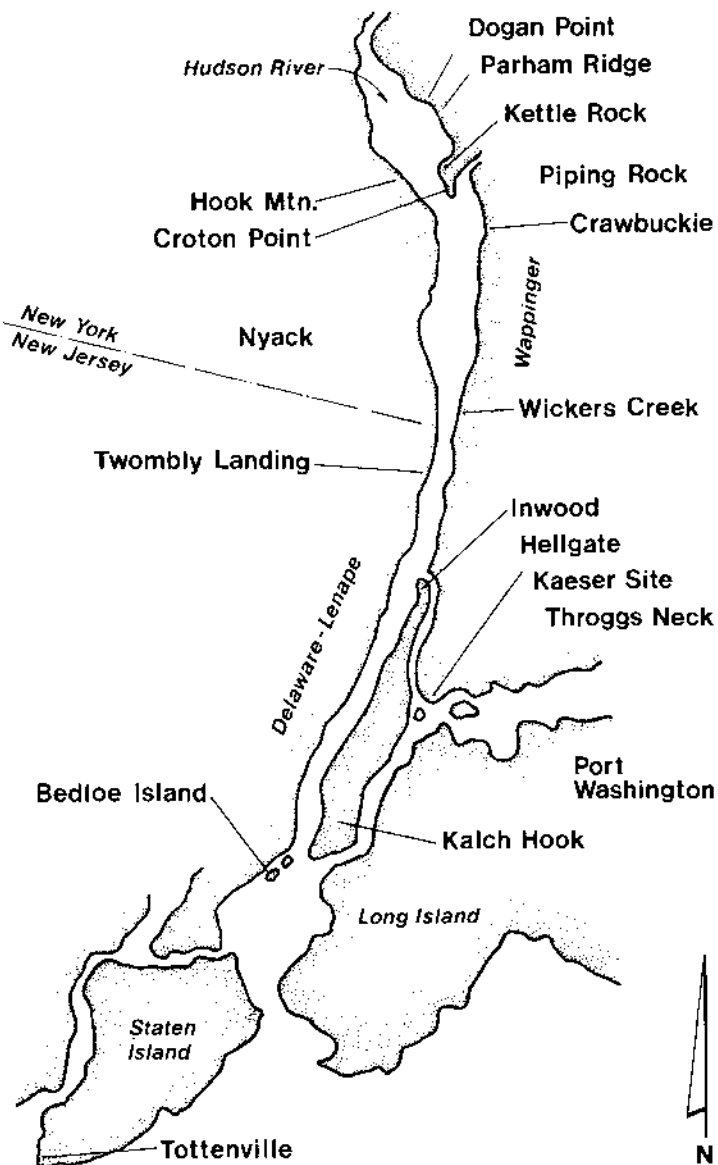
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The Bulletin

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Shell Middens in the Lower Hudson Valley

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Evidence of the Colliers' Industry in Mastic Neck, Brookhaven Township, Suffolk County, New York

Robert J. Kalin, Suffolk County Community College

Charcoal making was an important industry on Long Island, figuring prominently in the early economy and development of the area. The physical remains of three features determined to be colliers' hearths, where charcoal was prepared, were found on land, formerly part of the Smith Patent on the west side of Mastic Neck in Suffolk County, New York. While one of the features had a topographic manifestation consisting of a raised earthen ring about 7 m (23 ft) in diameter, others were discovered only by intensive shovel testing. The charcoal pieces recovered were large and were found in a bed approximately 10 cm (4 in) thick.

Introduction

Charcoal was an essential product of colonial and later times and its production an important industry on Long Island, figuring prominently in the economy and development of the area to about 1900. It was commonly used for the preparation of gunpowder, in the smelting of metals, to provide an intense heat in blacksmiths' and farriers' forges, and as a purifying agent for food and water on shipboard. This useful substance was made by piling cut and aged wood in an earthen depression or "hearth" and burning it under controlled conditions. Charcoal is produced with a deficit of oxygen; accordingly, the fuel was covered by turf or soil to control the amount of air entering the mass. In the process, water and volatile substances are driven off, leaving charcoal behind. Constant tending of the turf covering was required to control the air entering through openings, since excess air would cause a conflagration which would turn the whole mass into worthless ash. When the burn was complete, the charcoal makers or colliers would uncover the mass, sort and separate the charcoal, and pack it for transport. The advantages of charcoal over wood are its much reduced weight, smokeless burn, and higher burning temperatures. Though there is historical evidence of the colliers' activities on Long Island, to my knowledge no description of physical remains of such activities has been published. The present brief report seeks to remedy this omission.

Charcoal hearths were built in wooded districts in Medieval Britain. In Hampshire, Great Britain, the wraiths of mists arising from the trees are still called "colliers," since they resemble the small thin smoke arising from a charcoal fire. The charcoal burner lived by his hearths, in small quickly assembled huts, tending them day and night until the earth covering could be withdrawn and the brittle, iridescent charcoal cooled and made ready for packing and

transport (Hartley 1979:213). These practices were carried to the New World by the early colonists, who used methods similar to those employed in Britain. Several authors of Long Island history have alluded to the use of charcoal and its production on Long Island (see Bigelow 1968; Kelly 1980; Newton 1981; Yeager 1973). It was an important industry on the Island from colonial times and continued into the early part of this century. Blacksmiths and farriers used charcoal for heating and welding iron; therefore, a market for it must have continued for as long as they operated small local forges. A blacksmith shop site, located in Miller Place, New York, and dating from about 1821, had quantities of coarse charcoal similar to that recovered at this Mastic site, scattered over the area (Kalin 1987).

During the course of a cultural resources assessment of a parcel of land bordering the Carman's (Connecticut) River in Floyd Harbor (formerly Shirley) on the west side of Mastic Neck, Brookhaven Township, Suffolk County, New York, concentrations of coarse charcoal were found in several areas during the phase of the survey in which a gridwork of test holes, separated at 10-m (33-ft) intervals, was dug over 10% of the parcel. In addition, a surface manifestation, consisting of a raised earthen circle with an inner depression, was observed to be associated with one of the areas of charcoal concentration. Two other areas of high concentrations of coarse charcoal had no surface manifestations. The immediate physical evidence suggested that these features were the remains of charcoal makers' hearths.

The Mastic Neck Colliery Site is located on the west side of Mastic Neck on the glacial outwash plain south of the Ronkonkoma Moraine. The western boundary of the land parcel is less than 200 m (656 ft) from the Carman's River, and it is bounded on the south by Montauk Highway (Figure 1). Two distinct vegetation zones exist in the area. A narrow border of woodland, about 40 m (131 ft) wide, dominated by red maple, oak, and hickory with various associated vines, bushes, and forbs, is found along the western property boundary in low-lying, more poorly drained soil. This grades into a community of pitch pine and oak on the excessively drained soils of the eastern portion of the parcel.

An increment borer was used to core several trees in the vicinity of the hearths. The results indicate that the woodland in the vicinity of the hearth had been cut over early in this century.

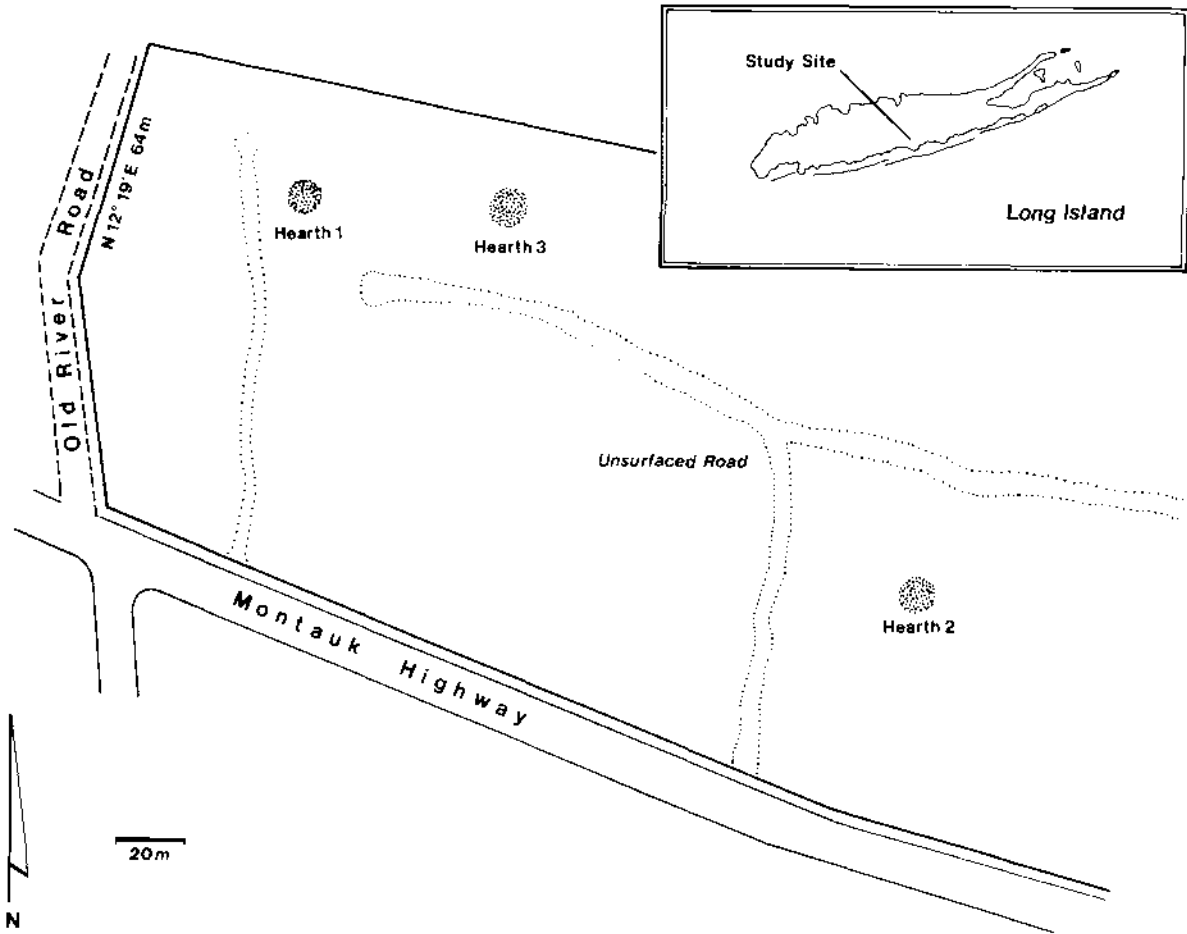


Figure 1. Sketch map of study area and location map of Long Island.

The hearths predate the most recent forest growth on the parcel.

Three areas of charcoal concentration were found in the study area; however, only one of these had a clearly definable hearth and heavy concentration of charcoal. The other possibly older manifestations were undefined topographically and had less concentrated deposits of charcoal. The charcoal pieces recovered at the sites were large (some were 3.5 cm [1-2 in] in diameter and 5-6 cm [2-3 in] long), and at Hearth # 1 were found in a layer about 10 cm (4 in thick). Hearth #1 had a topographic manifestation consisting of a depressed central area surrounded by a slightly raised earthen ring about 7 m (23 ft) in diameter. The presence of two nearly upright oak timbers about 15 m (50 ft) north of the hearth suggested a possible structure (e.g. a collier's hut). All three features were discovered as a result of the random subsurface (testing) phase of the survey. Future identifications of these and other features, that have little or no topographic

manifestation will depend upon the subsurface testing of a significant portion of project areas during field surveys for the preparation of cultural resources assessment reports (see Figure 1).

Several test pits were dug at the site of Hearth # 1. Profiles of the pits suggest that soil was dug from the central depressed portion of the hearth, an area with a diameter of about 5 m (16 ft), possibly as blocks of turf. These may have been piled up on the periphery of the hearth as the hearth structure was built in the central area. Historical accounts indicate that charcoal hearths or "pits" were pyramidal structures built on triangular bases of logs. For Hearth #1, it appears that within the 5 m (16 ft) depressed area a triangular base of logs about 4.5 m (15 ft) long enclosed an area of nearly 9 sq m (97 sq ft). Assuming the height to be almost 4 m (13 ft), the capacity of the pyramid would have been somewhat more than 10 cu m (13 cu yd) or enough space to have processed about three cords of wood (Figures 2 and 3).

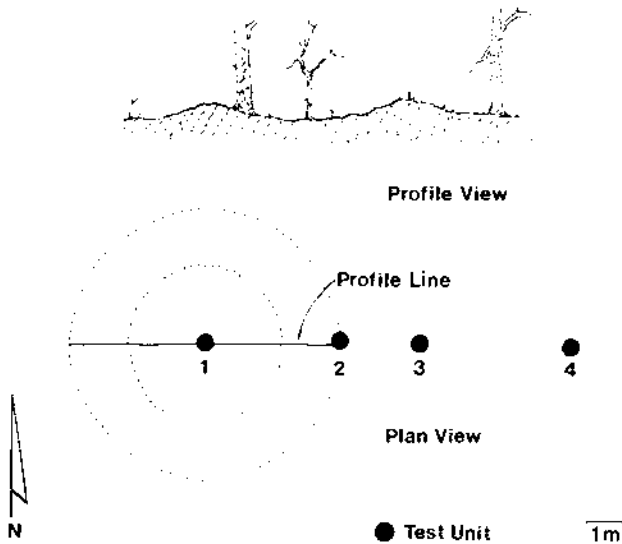


Figure 2. Profile view and plan view of Hearth #1, with positions of test pits.

A description of methods used in 1885 indicates local colliers constructed a wood pyramid by laying pine, oak, or cherry logs in a triangle on the ground with only the ends touching.

From a base a dozen or more feet across, the structure would gradually be narrowed until at the peak only a small opening remained. Through this opening, by means of a ladder, other pieces were dropped inside the pyramid until it was crammed full to the top. Over the whole structure a layer of turf, some four or five inches thick would be packed and over this, two inches of sand, tamped down to keep it all in place [Yeager 1973:190].

According to Yeager's account, typical charcoal pits of the 1880s processed about three to five cords of wood which produced about 80 bushels of charcoal, worth about fifteen cents a bushel at that time. They preferred to use green oak saplings, and thus tended to follow after, by several years, the cordwood cutters, cutting saplings sprouted from stumps (Yeager 1973: 190).

The early history of Mastic Neck suggests that it may have been an important source of charcoal as early as the latter part of the eighteenth century, when Colonel Nicoll Floyd's forge operated on the Mastic (later Forge) River only about 5 km (3

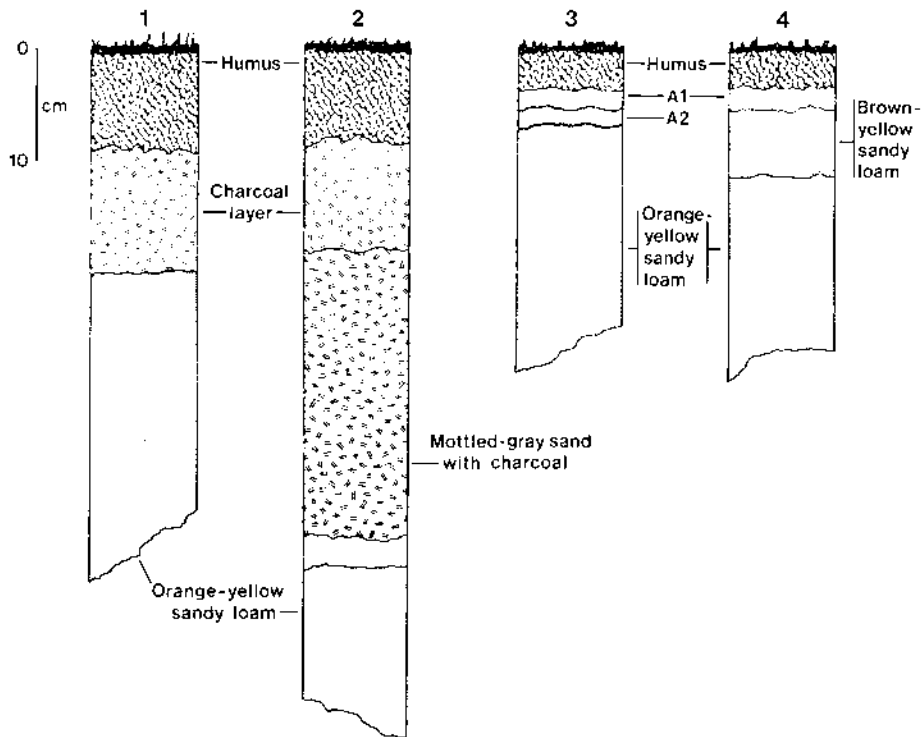


Figure 3. Columnar sections of north wall of Test Pits 1-4. See Figure 2 for positions relative to topographic feature.

mi) east of the Colliery Site. The forge would have required large quantities of charcoal. The availability of abundant wood to convert into charcoal on Mastic Neck may have been an important consideration in siting the Floyd Forge.

Summary

Charcoal making was an important industry on Long Island until about 1900 and figured prominently in the economy and development of the area. The availability of abundant charcoal may have been one of the more important considerations in siting the early Floyd Iron Forge, which was in operation on the east side of Mastic Neck late in the eighteenth century. The physical remains of features determined to be colliers' hearths, where charcoal was prepared, were found on land formerly part of the Smith Patent on the west side of Mastic Neck in Suffolk County, New York. The charcoal pieces recovered at the sites were large and were found in a bed as much as 10 cm (4 in) thick. One of the features, Hearth #1, had a topographic manifestation consisting of a raised earthen ring about 7 m (23 ft) in diameter. Historical accounts and physical evidence collected at the site suggest that a wood pyramid, with a capacity of about 10 cu m (13 cu yd), was built in the central portion of the depressed area of Hearth #1. Increment borings of nearby trees indicate that the woodland in the vicinity of the hearths had been last cut over in the early part of this century.

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New Evidence for Early Postglacial Occupations in the Upper Hudson Valley

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The Bennett Collection offers a body of data that demonstrates that Paleo-Indian and Early and Middle Archaic populations were present in the Upper Hudson Valley. The results of an attribute analysis conducted on 35 projectile points from this collection will be presented. The implications of the Bennett Collection for addressing the apparent absence or scarcity of early postglacial remains in the Northeast will also be considered.

Our understanding of Hudson Valley prehistory is largely a result of research by Ritchie (1958) and Funk (1976). One of the objectives of Funk's (1976) study was to fill in the gaps in the cultural sequence that Ritchie (1958) had provided. While considerable progress was made in realizing this goal, Funk did not encounter in situ evidence for the occupation of the Hudson Valley by Early and Middle Archaic populations. Furthermore, the Upper Hudson Valley, defined as the region extending from Lake George to Troy, appeared to have the most truncated prehistoric sequence, since neither Paleo-Indian nor Early and Middle Archaic sites were located. However, 52 bifurcated-based points, 11 of which were found in the Upper Hudson Valley, were recovered from disturbed or surface contexts (Funk 1976:195). Funk (1977:24) also identified several Neville Stemmed points in Upper Hudson Valley collections.

Until 1984 (Ritchie and Funk 1984), Funk argued that there was little evidence to suggest that the Northeast was occupied between Paleo-Indian and Late Archaic times. Since Funk (1976:194) maintained that non-site contexts were an inferior data source, he characterized the northeastern prehistoric sequence as discontinuous. Funk's position changed only after in situ evidence for Early and Middle Archaic occupations of the Northeast was obtained from the Upper Susquehanna Valley. These data coupled with numerous other finds led Ritchie and Funk (1984) to conclude that the temporal gap which once seemed to characterize the archaeological record in the Northeast has become increasingly narrow.

While some researchers may choose to neglect the significance of non-site contexts, the importance of non-site contexts should not be ignored. Although non-site contexts may be inappropriate sources of data to address some issues, they can help answer certain kinds of questions. In this essay, non-site contexts will be used to provide new evidence in support of Ritchie and Funk's (1984) current perspective concerning early postglacial occupations of the Northeast.

The Bennett Collection is a large collection of artifacts gathered early in this century from the Hudson

Valley. A series of 35 projectile points from the Bennett Collection is the basis for the contention that there is no hiatus in the Upper Hudson Valley prehistoric sequence. Given the contents of the Bennett Collection, alone or in conjunction with the non-site-related finds of Funk and the Early Archaic artifacts unearthed at the Harrisena Site in the Lake George region by Snow (1977), one can argue that the Upper Hudson Valley is not devoid of early postglacial occupations but rather possesses a continuous sequence of habitation from Paleo-Indian to historic times. The implications of the Bennett Collection for hypotheses that have been advanced to account for the apparent absence or scarcity of early postglacial remains in the Northeast are significant.

The Bennett Collection

The Bennett Collection contains Paleo-Indian, Archaic, and Woodland artifacts; projectile points are the largest class of artifacts in the collection. The artifacts were collected during the early 1900s by Mr. Nelson C. Bennett, a Station Master for the Delaware and Hudson Railroad Company, who lived in Waterford, New York. In 1918, Colonel Walter Scott and Edith Magra purchased the collection from Mrs. Bennett after her husband's death. Shortly thereafter, the collection was given to Smith College in Northampton, Massachusetts. The collection was exhibited in Burton Hall for several years and has been housed at the University of Massachusetts at Amherst since 1965 when this institution acquired the collection from Smith College. With the exception of some efforts by students at the University of Massachusetts to catalog the artifacts, the collection has never been studied. In 1976, Professor Dena Dincauze interviewed Nelson C. Bennett's son to gather information concerning the history of the collection and the collector himself. Mr. Bennett's son informs us that his father's collecting strategies were closely guided by the Delaware and Hudson railway route. In cases where only the county was noted, it is suggested that the artifacts were most likely retrieved from towns adjacent to the railroad line. A section of the Delaware and Hudson railway route c. 1928 is shown in Figure 1 (Rand McNally and Company 1928).

Researchers may have been disinclined to study the collection since the provenience data available are incomplete. In every case where provenience data were recorded, all informa-

tion was written directly on the artifact itself (Figure 2a). The quality of the provenience data varies from artifact to artifact. Items either possess no provenience data, are identified by town and county, or are only identified by county.

Methodology

Projectile points which appeared to relate to types diagnostic of early Holocene cultural manifestations were isolated from the rest of the collection. An attribute analysis was conducted to group the projectile points into culturally and temporally meaningful classes, using published typologies (Broyles 1971; Chapman 1977; Coe 1964; Dincauze 1976). While technological attributes were studied most intensively, morphological attributes were also considered. Metric attributes of the projectile points were not studied since they are of little consequence in collection analyses. Not all of those projectile points originally isolated are discussed here; projectile points that did not possess any provenience information are not reported here because the purpose of this study is to

demonstrate late glacial and early Holocene occupations in a specific geographic area. Since the stratigraphic context of the projectile points is unknown, those specimens that suffered too much basal damage, thereby rendering their cultural affiliation ambiguous, are also excluded from the discussion. Consequently, the analysis is limited to 35 projectile points. All 35 projectile points were collected from either Saratoga or Washington counties (Figure 1). It will be mentioned in the text when the provenience for projectile points was recorded by county and by town.

Artifacts

Provenience information was noted for only one of the five fluted projectile points that are represented in the Bennett Collection. This fluted point (Figure 2a) was recovered from the town of Crescent in Saratoga County. This point possesses a pronounced basal concavity. Short multiple flutes struck on both faces extend one-third up the surface of the point. The absence of basal and lateral grinding and the lack of secondary

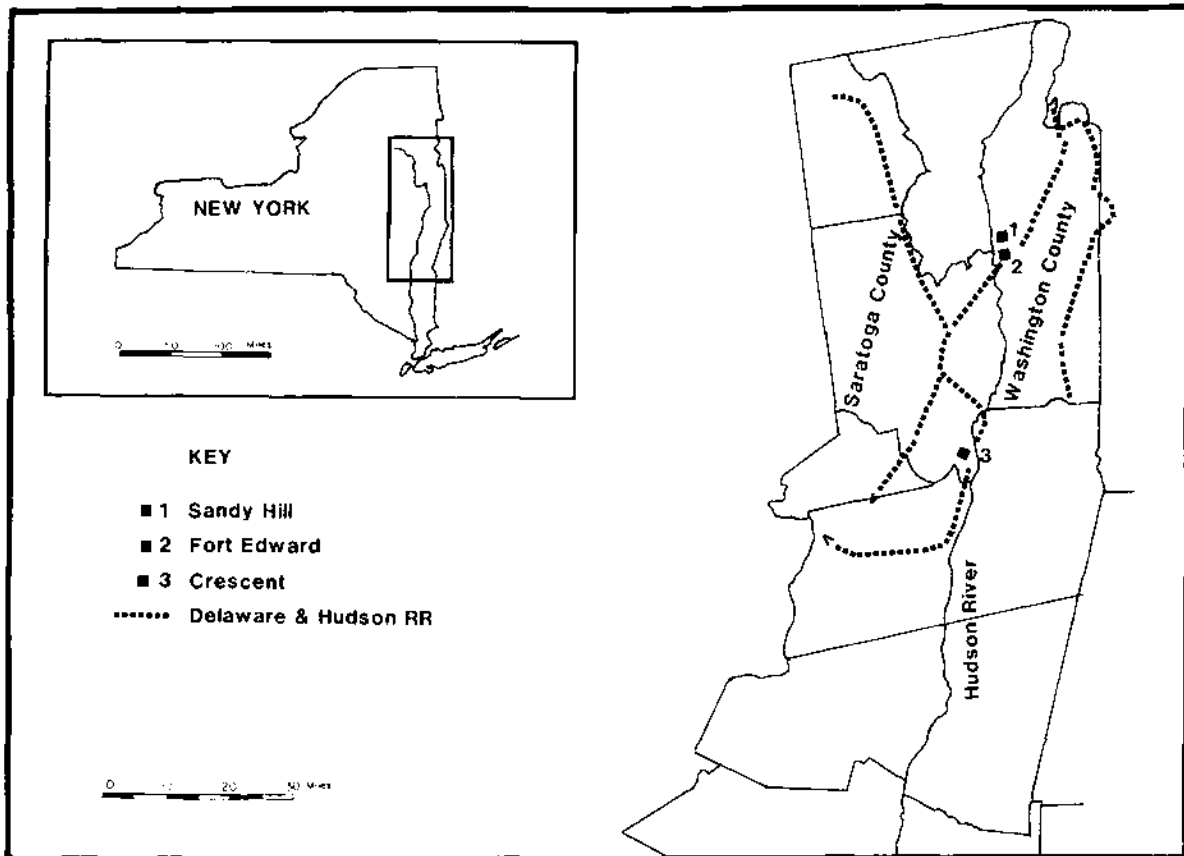


Figure 1. Location of place names mentioned in text.

retouch to regularize the edges indicate that the specimen is unfinished. The technological attributes of this fluted point suggest that the Upper Hudson Valley was occupied during Early Paleo-Indian times.

Three specimens are identified as Hardaway Side-Notched (Figure 2b-d). Two projectile points are from Washington County, and one is from Fort Edward in Washington County. All three points possess the small, narrow, U-shaped notches and concave bases which are characteristic attributes of this type (Coe 1964:67). The manufacturing process that produced these two traits resulted in the distinctive flaring of the ears. This feature is most pronounced in specimens 2b and 2c. Hardaway Side-Notched points are considered transitional Late Paleo-Indian/Early Archaic forms, occurring in stratigraphic levels below those of Kirk Corner-Notched points in North Carolina (Coe 1964:63).

One specimen from Washington County (Figure 2e) displays a series of attributes indicative of Kirk Corner-Notched points as described by Broyles (1971) and Chapman (1977). The point is triangular in shape and corner-notched. The surfaces of the point are particularly flat, and the base is extremely wide. In well-stratified sites, this point style appears in layers that are associated with the initial expression of the Early Archaic (Broyles 1971).

The Bennett Collection yielded seven provenienced examples of St. Albans Side-Notched projectile points (Figure 3a-g). Five were located in Saratoga County, one item was found in the town of Crescent in Saratoga County, and a single specimen was recovered from Washington County. The projectile points are distinguished by the presence of side and

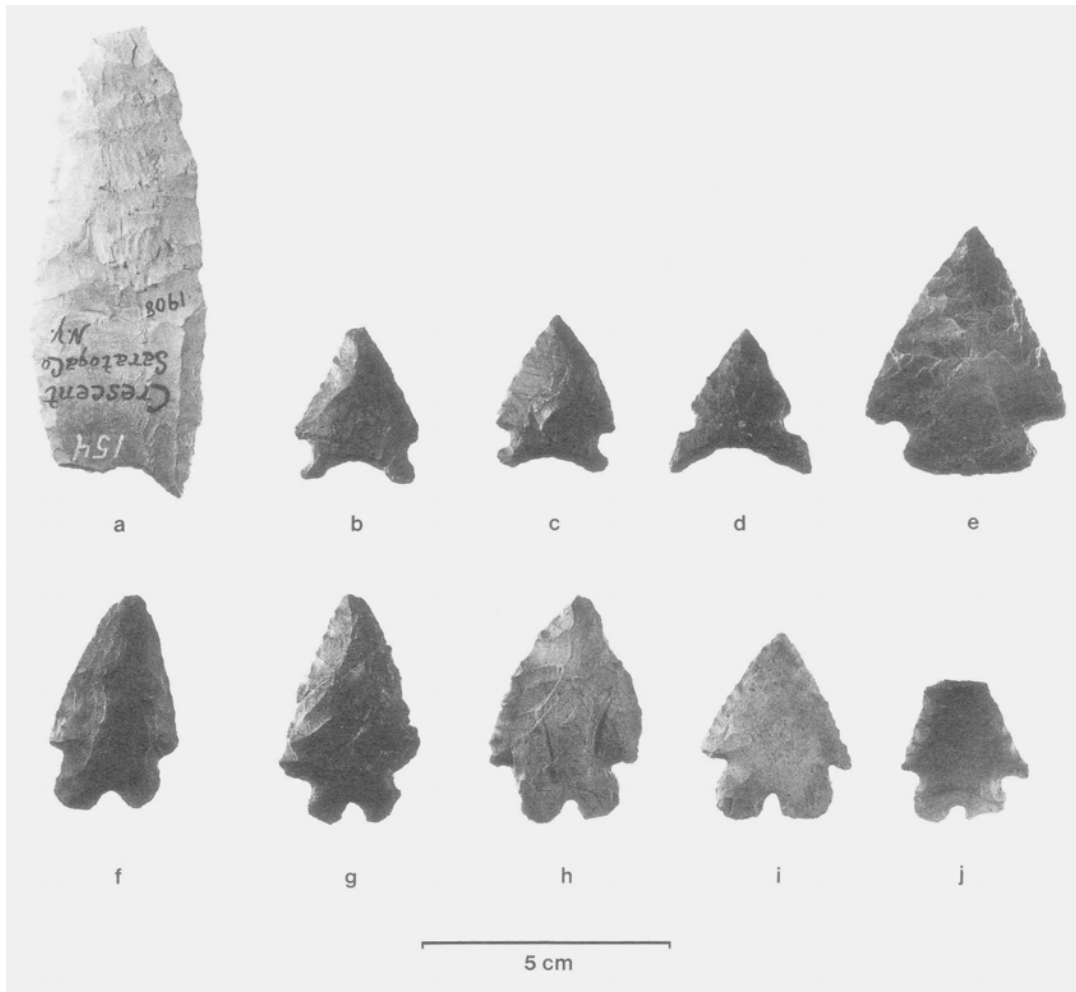


Figure 2. a) Fluted point; b-d) Hardaway Side-notched; e) Kirk Corner-Notched; f-j) LeCroy Bifurcated Based.

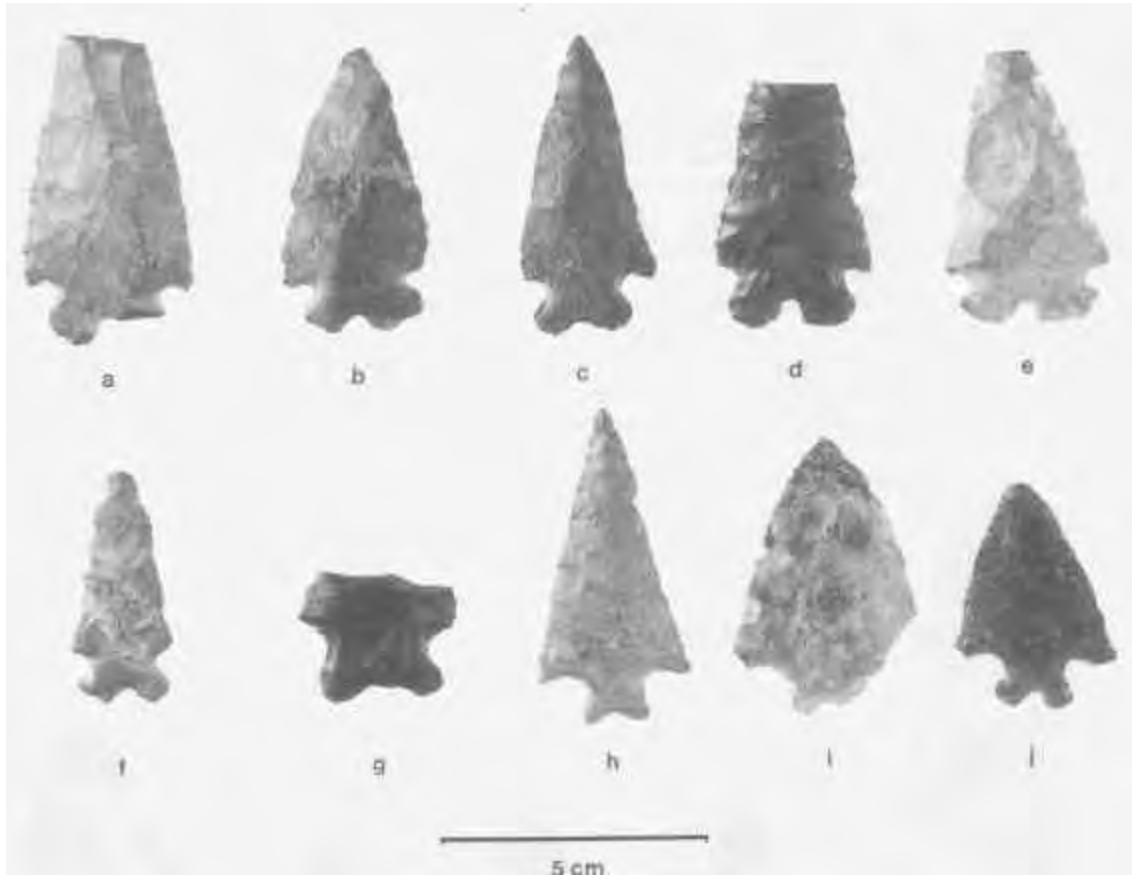


Figure 3. a-g) St. Albans Side-Notched; h-j) Kanawha Stemmed.

basal notching. More importantly, the technological process used to remove the side notches did not create horizontal shoulders but did produce very thick cross-sections. When found in sites with good stratigraphy, this point style is situated above Kirk Corner-Notched points and below LeCroy Bifurcated Based points (Broyles 1971:49), a position that places it in the Early Archaic Period (Broyles 1971:72-75).

LeCroy Bifurcated Based projectile points were also represented in the Bennett Collection (Figure 2f-j). Two specimens were found in the town of Sandy Hill in Washington County, one item was recovered from Saratoga County, and two points came from the town of Crescent in Saratoga County. Although LeCroy Bifurcated Based points have several traits in common with St. Albans Side-Notched points (e.g., side and basal notching), the manufacturing technique distinguished them from each other. The flaking technique employed to shape this point style created horizontal shoulders and straight lobes. These particular characteristics have also been noted by Chapman (1977:37). In cross-section, LeCroy Bifurcated Based points are much thinner than St. Albans Side-Notched points. In stratigraphic contexts, LeCroy Bifurcated Based

points occur above St. Albans Side-Notched points and below Kanawha Stemmed points (Broyles 1971:49). Like Kirk Corner-Notched and St. Albans Side-Notched points, LeCroy Bifurcated Based points are dated to the Early Archaic.

The Bennett Collection contained three Kanawha Stemmed (Broyles 1971:59) or Short Narrow-Stemmed Bifurcated Based points (Chapman 1977:35). One artifact came from the town of Sandy Hill in Washington County, a second was recovered from Saratoga County, and the third was found in the town of Crescent in Saratoga County (Figure 3h-j). All three points have had side and basal notches removed from them. Stems are small (approximately one-third the width of the base) and are centrally divided by two tiny, narrow and expanding lobes (Broyles 1971:59). These points are also extremely thin in cross-section. Kanawha Stemmed points are regarded as transitional between Early Archaic LeCroy Bifurcated Based points and Middle Archaic Neville Stemmed points (Broyles 1971:59; Chapman 1977:35).

Middle Archaic Neville Stemmed points are extremely

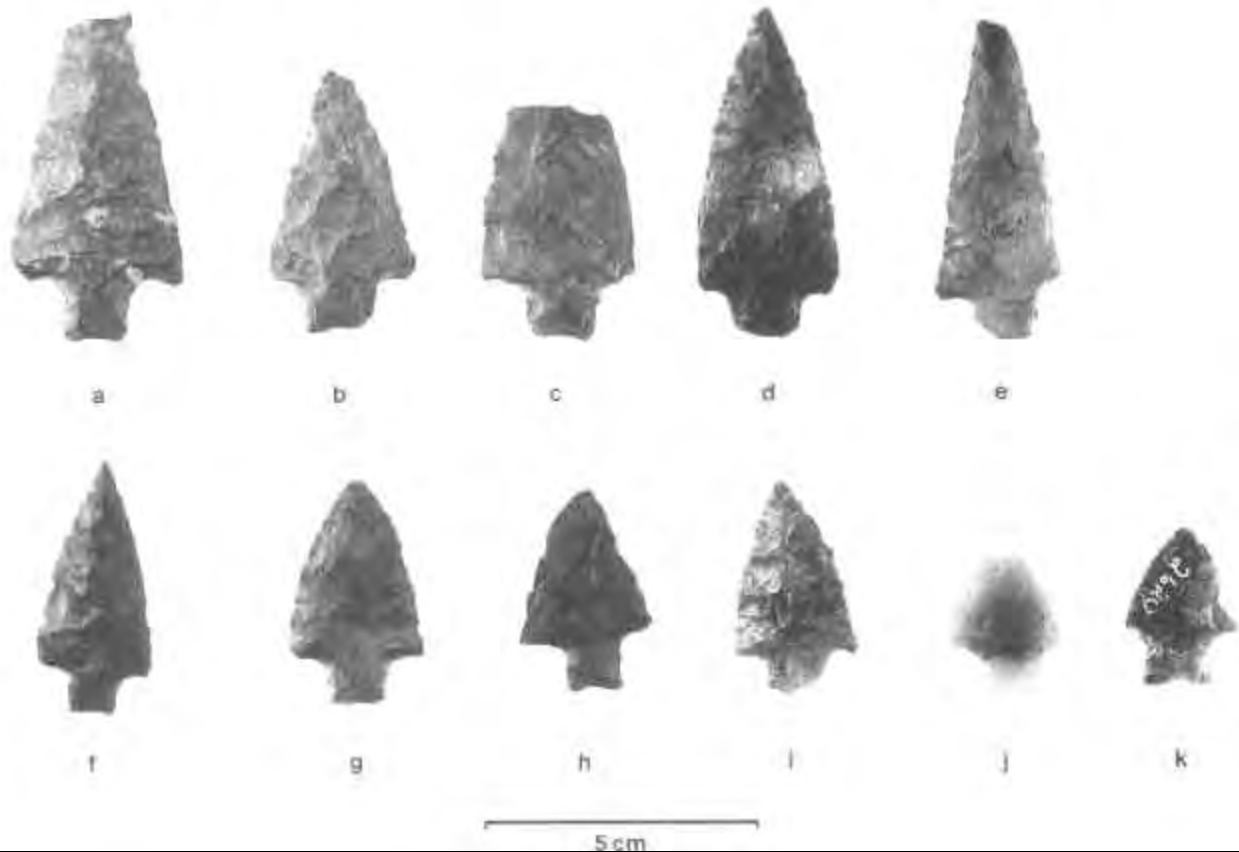


Figure 4. Neville Stemmed.

well represented in the Bennett Collection (Figure 4). Two artifacts from Washington County, seven items recovered from Saratoga County, and two specimens found in the town of Crescent in Saratoga County are identified as being Neville Stemmed points. Neville points are carefully shaped, have shallow expanding flake scars, are lenticular in cross-section, possess stems that usually either taper towards the base or are formed by parallel sides, and have shoulders which are defined by acute angles (Dincauze 1976:36-37). These technological and morphological attributes which define Neville points are present in eleven points.

Four Stark Stemmed points were also identified in this collection (Figure 5). Stark points possess tapered stems which frequently end in a facet, are thick in cross-section, and have shoulders defined by obtuse angles (Dincauze 1976:31-33). All four specimens from the Bennett Collection have tapering stems, are thick in cross-section, and have obtuse shoulder angles. Only one specimen has an unfaceted base. Stark Stemmed points are also recognized as being Middle Archaic manifestations (Dincauze 1976).

Discussion

Collection analyses are potentially profitable and rewarding endeavors. The Bennett Collection contains evidence that demonstrates that the Upper Hudson Valley was occupied during Paleo-Indian and Early and Middle Archaic times. This collection is thus a significant addition to a growing body of data which indicates that the Northeast was not devoid of early postglacial occupations. Consequently, the results of this analysis together with other lines of evidence put into question explanations that have been offered to account for the alleged absence or scarcity of early postglacial manifestations in the Northeast.

Northeastern archaeologists who attempted to make sense of the postulated interregnum believed to have characterized the archaeological record between 9000 and 6000 years B.P. most frequently advanced environmentally oriented explanations. The theoretical foundations for this line of thinking can be traced to the work of Fitting (1968). Fitting (1968) suggested that from the 9th millennium through the 6th millennium,



Figure 5. Stark Stemmed.

the Northeast was covered by a coniferous forest which was poor in plant and animal resources. The presumed limited carrying capacity of the environment during Early and Middle Archaic times was argued to have inhibited early postglacial populations from occupying the ecologically unfavorable Northeastern region of North America. This notion was also shared by several members of the New York State archaeological community (Funk 1976, 1977, 1979; Ritchie 1969, 1971, 1979; Ritchie and Funk 1971, 1973). Although archaeologists (Ritchie and Funk 1984) have modified their views concerning the idea of discontinuity, some (Funk and Wellman 1984) continue to utilize an ecological perspective to account for the scarcity, as opposed to the absence, of early postglacial archaeological sites. However, this ecological perspective can be challenged on paleoenvironmental and archaeological grounds.

Recent studies which have examined the nature and content of early postglacial habitats have demonstrated that environmental conditions were neither limiting nor scarce in floral and faunal resources (Dincauze and Mulholland 1977; Nicholas 1986). It seems unreasonable to suggest that the alleged scarcity of early postglacial remains in the Northeast can be attributed to the limited carrying capacity of the environment. Furthermore, the archaeological evidence for Early and Middle Archaic

occupations across Northeastern North America is far from negligible. Early and Middle Archaic cultural manifestations have been noted in northern New England (Speiss, Bourque, and Gramly 1983), southern New England (Starbuck and Bolian 1980), and Ontario (Wright 1978). The work of Snow (1977) at the Harrisena Site and the contents of the Bennett Collection are testimonial to the fact that northeastern New York was also inhabited by Early and Middle Archaic populations. It is clear that when paleoenvironmental and archaeological data are considered, ecological perspectives based on the notion of resource scarcity are invalidated.

Conclusion

The Bennett Collection offers a body of data which demonstrates that Paleo-Indian and Early and Middle Archaic populations were present in the Upper Hudson Valley. The nature and content of the collection coupled with other lines of evidence supports the idea that the prehistoric record in the Northeast is not characterized by discontinuity. Longstanding assumptions concerning the nature of the environment and the archaeological record must be reconsidered if archaeologists are to move toward a better understanding of early postglacial occupations of the Northeast.

Acknowledgments

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Shell Middens in the Lower Hudson Valley

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The shell middens of the Lower Hudson Valley are features reflecting prehistoric life. The "kitchen middens" resulting from meals are distinguished from "processing middens" formed while preparing food for storage. The alleged use of deep pits as "baking" ovens for shellfish is questioned. Processing large quantities of oysters suggests probable cooperative activity.

Introduction

Of all the traces left by the aborigines along the New York seacoast, the most abundant and familiar are the shell heaps [Harrington 1909:169].

The prehistory of the Lower Hudson Valley is still insufficiently known because the "encroachment of metropolitan New York has now obliterated most of the archaeological sites on Manhattan Island, Staten Island and western Long Island and the adjacent mainland" (Smith 1950:101). During the construction of the railroads, for example, the track system was run indiscriminately through many shell middens along the eastern Hudson shore before adequate archaeological investigations could be undertaken. The Lower Hudson Valley, for purposes of this study, includes Manhattan, Staten Island, and the land extending northward toward Peekskill between the river and the Long Island Sound (Figure 1).

Existence of the string of shell middens along the river shores has long been accepted by archaeologists as an indication of prehistoric habitation. Their research has, however, concentrated mainly on the cultural artifacts found in context with middens rather than on the shell deposits themselves. But, eventually, attention turned to the middens.

From the beginning of excavation in 1950 the objective has been to discover the function of these riparian loci in the lifeway of the hunter-gatherers who discarded the shell there and to infer from that function how the lifeway was scheduled, ordered and conducted throughout the subsistence year within the territory of band exploitation [Brennan 1981:42].

The intent of this study is to extend the probing. Among its considerations are distinguishing between shell middens resulting from meals and those accumulated during processing for storage, exploring the techniques used to separate meat from shell, and understanding the organization of work within cooperative patterns in oyster fishing.

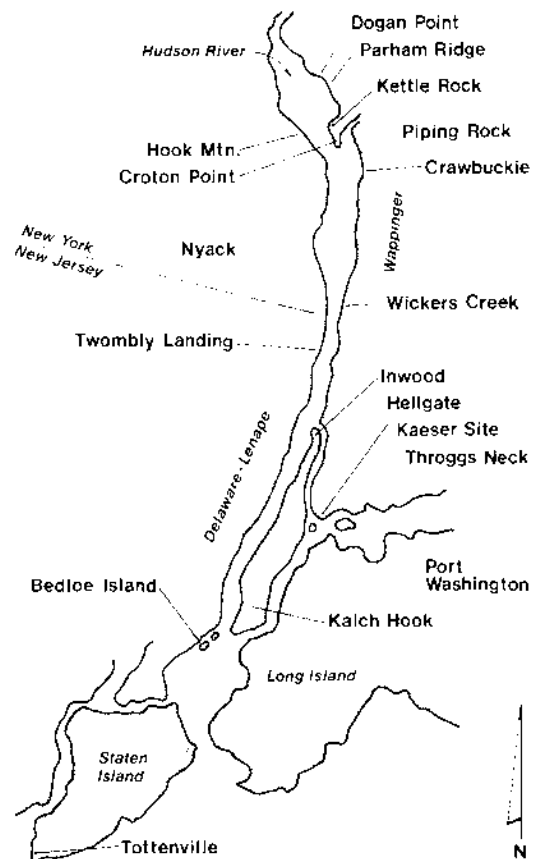


Figure 1. Shell middens in the Lower Hudson Valley.

Environmental Factors

When the Wisconsin ice sheet retreated from its Manhattan terminus about 12,000 years ago, the continental shelf was part of the mainland, extending 150 km (95 mi) to the east of the present coastline. As the ocean reclaimed the shelf area, the flora and fauna returned in the course of a few millennia to the scraped bedrock of southern New York. Apparently, sufficient subsistence resources, such as mammoth, musk-ox, walrus, giant sloth and caribou, existed for the early hunter/forager bands when they entered the region. Marsh birds, their eggs, and nestlings were likely also available to supplement the food larder of Paleo-Indians (Kraft 1977:1).

As the ecosystem evolved some large animal species became extinct, but by 8000 B.P., the spreading deciduous forests favored another group of game animals including deer, bear, and turkey. Various species of nut-producing trees also became more numerous (Funk 1977:26). Oyster beds of the species *Crassostrea virginica* were already established by 10,000 B.P. along the eastern Atlantic coast as far north as Georges Bank off Cape Cod. "An unstable salinity regime is an important ecological factor in the tidal rivers and streams inhabited by *C. virginica*; diurnal, seasonal, and annual fluctuations are the normal features of such an environment" (Galtsoff 1964). The salinity range for oyster survival and reproduction is about 10% to 30% but its uneven distribution along the 200 km (127 mi) of Lower Hudson shore is not the only criterion influencing oyster life. Diseases, predators, sediment conditions, and geological changes also play important roles.

The sea level rise caused by the melting of glacial ice masses constitutes only one of many variables in shell midden history. It affected the depth of the Hudson River, which in turn inundated its shores. Many middens in the Haverstraw Bay area stem from the Archaic Period, while the huge oyster beds between Bayonne and Paulus Point (the source of a multitude of Woodland middens) did not form until after 2500 B.P. (Pousson 1986:11). "As recently as 1839 it was estimated that these waters produced in excess of one and a half million bushels of oysters annually" (Hudson River Valley Commission, State of New York 1966) The Lower Hudson retained no less than 910 sq km (350 sq mi) of productive oyster grounds.

Research

Shell middens are prehistoric features which occur on all continents, from the Pacific coast to the impressive mounds of Denmark and Spain, from Japan to Australia (Bailey 1978; Butzer 1982; Kroeber and Barrett 1960). In the Hudson Valley, the earliest archaeological reports on middens date to the end of last century. The distinction between "kitchen-middens" and "processing stations" was duly noted even if prehistoric residents were occasionally referred to as "savages" (Skinner 1909a:234).

The excavation of oyster middens is slow and difficult. In addition, they tend to be devoid of artifacts and features. Not surprisingly, therefore, shell middens did not attract much enthusiastic attention in archaeological research. Until recent times, the cultural interpretation prevailed in scholarly analysis, culminating in the conclusion that the Hudson shell middens had been accumulated by Woodland people, but, ultimately the excavations along the river's shores focused on the character of the shell middens themselves (Brennan 1981), and the Archaic origin of several middens was demonstrated by the radiocarbon dating of shells.

The changes in sea level and their effects on the area's archaeology and its mollusc population were effectively investigated (Salwen 1962). Efforts continue to perfect

seasonality tests of shells in archaeological contexts. Various tests such as sclerochronological techniques based on "growth breaks," can serve to determine the season when the molluscs were harvested, or time spans involved in the accumulation of shell middens (Butzer 1982; Kent 1988). In the Hudson Valley, seasonality tests may answer the question whether oysters were harvested predominantly in late winter when other food sources were at their lowest ebb or whether they were gathered throughout the year when feasible (Wingerson 1985:4).

Investigations of shell deposition concluded, in the case of the Kaeser Site, that "on such sites, stratigraphy may often be visible in the spatial separation of chronologically distinct materials rather than in the superposition of such materials" (Rothschild and Lavin 1977:1). The researchers also observed, "The midden was apparently accumulated by the occupation of different areas of the site at different time periods, rather than a uniform occupation which might result in a more typical layer-cake stratigraphy" (Rothschild and Lavin 1977:21).

Scientific investigations using ultraviolet light are still under way to determine temperatures to which oysters may have been exposed. If a shell had been previously heated to 315° C (600° F), then the rays will cause this shell to fluoresce yellow. It is suggested that stewing and baking of shellfish could thus be differentiated (Wingerson 1985:4).

The recognition and use of "marker years" at a specific site, likened to dendrochronological studies, could help to differentiate shell depositions and separate occupations (Kent 1988:78).

Further research appears warranted when shell deposits consist of oyster shell that is crenelated, thin, sharp, and highly pigmented. These symptoms are most likely the result of higher temperature levels often associated with increased salinity (Galtsoff 1964:406). Radiocarbon dating might then provide information on climatic changes which impinged on regional food supplies.

Shell Middens: The Evidence

As an offering which included tobacco, Indian wheat and beans, the first visitors to Hudson's Half Moon brought oysters aboard: 'Making a show of love' [Ruttenber 1971:9].

Eight decades ago it was observed that shell middens

may be seen all along the east shore of the Hudson River at more or less frequent intervals up as far as Peekskill ... on Croton Point [Figure 2] and between Nyack and Hook Mountain on the west shore they attain considerable size ... There are many shell heaps on Staten Island ... on Constable Hook, New Jersey, and at intervals between there and Jersey City along the western shores of New York Bay [Harrington 1909:178, 179].



Figure 2. Shell midden - Lower Hudson Valley. Photo by H. Schaper, 1988.

Several hundred shell deposits are noted in archaeological references to the Lower Hudson area (Table 1), but they represent only a fraction of the shells which prehistoric people discarded over the past ten millennia. Uncounted shell accumulations of Archaic vintage probably also Paleo-Indian became submerged by rising sea levels and may now be resting under the sands of the Continental Shelf. Many unrecorded middens were destroyed long ago in the course of progressing urbanization. Quantities of shell were burned for lime by colonists or carted away by farmers to "sweeten" (neutralize) their acid soils (Kraft 1986:78). Other middens were covered by buildings or railroad tracks and are inaccessible.

The Hudson middens contain predominantly the armor of the hard shell oyster (*Crassostrea virginica*) although practically every species of shellfish common to coastal New York entered the food supply. "These oysters in their natural habitat create dense beds formed by the continual process of larval oysters settling and growing on larger oysters and dead oyster shells. Eventually, a thick bed of shells may be accumulated similar to the way a coral reef is formed" (Edwards and Merrill 1977:28). However, midden shell is not found in clumps, but as individual valves.

The physical condition of shell middens varies widely. "Shell decomposition is a factor of species, condition of deposition, soil acidity, age, weathering, and perhaps other variables" (Sanger 1981:40). When, for instance, "oyster shell goes to pieces, it does not break through the shell, as does clam shell. It splits along the plates into thin fragments. This shattering rather than breakage occurs always in the same way, no matter what the agent" (Brennan 1962:150).

Shell will frequently enhance preservation of organic residue useful for ecological studies. At the Smoking Point Site on Staten Island "seventy-six percent of the total number of recovered bone comes from the shell stratum ... The calcium of the shell stratum is responsible for partially restoring soil pH to a neutral level allowing better bone preservation" (Amorosi 1984:107).

A sizable shell midden turned up recently during construction work on Liberty Island (Moore 1986:644). The site seems to indicate Woodland occupation, but the project is still being analyzed (Pousson 1986).

Several shell middens, about 30 m (99 ft) above the river, constitute the Wickers Creek Site, 40 km (25 mi) upriver. Nearby, a midden below track level of the Metro-North Rail road was exposed this summer during trenching work for cables. Many of these shells measure 12 to 15 cm (5 to 6 in) and approach the largest specimen found at topside middens on the Mercy College grounds (Kaeser, personal communication). The excavations early this century here produced chipped flint, pestles and potsherds which were sent to the New York State Museum at Albany (Parker 1922:714). The artifacts suggest Woodland occupation but Edward J. Kaeser has also excavated Archaic projectile points which indicate earlier repeated use of this site.

The size of individual middens in the Hudson Valley ranges from lenses of just a few square meters containing many thousands of shells to substantial accumulations spread over several hectares. Reports list "immense shell beds" found at Hellgate (Finch 1909:73) and shell heaps estimated to cover several acres (Harrington 1909:170). At the Dogan Point Site the "whole eastern slope, two to three acres in extent, must have been covered with midden shell, probably to considerable depth" (Brennan 1972:6). The extent of yet unexcavated areas at Dogan Point above the present water line was mapped during the summer of 1937 by means of a pattern of auger test borings (Claassen 1987).

By way of comparison, shell middens as large as 2000 cu m (2616 cu yd) from the Archaic Period were documented in Denmark (Bailey 1978).

Discussion

The first people entering the Lower Hudson area were Paleo-Indian hunters. Artifacts of that period surfaced at Port Mobil on Staten Island and at Piping Rock in Ossining, while a number of fluted projectile points were found in the area.

Table 1. Significant Shell Deposit Sites in the Lower Hudson Valley.

Location	Size	Living Areas	Activity Areas	Faunal Remains	Midden Type	Period
Dogan Point	140 m lg.	not present	not present	not present	processing	Archaic Transitional Woodland
Parham Ridge	-	not present	-	not present	kitchen	Archaic Transitional Woodland
Kettle Rock	-	not present	not present	some	processing	Archaic
Piping Rock	several acres	present	present	present	kitchen	Archaic Transitional Woodland
Crawbuckie	-	-	-	not present	kitchen	Woodland
Wickers Creek	(1) acre	resent	present	present	processing kitchen	Archaic Transitional Woodland
Twombly Landing	1/4 acre	present	present	present	kitchen	Archaic Woodland
Inwood	-	present	present	present	kitchen	Woodland
Kaeser Site	(1) acre	present	present	present	kitchen	Archaic Woodland
Throggs Neck	-	present	present	present	kitchen	Woodland
Hellgate	huge	-	-	-	processing	-
Kalch Hook	(1) acre	present	-	-	-	Woodland
Bedloe Island	-	-	-	-	-	Woodland
Tottenville, S.I.	-	present	present	present	-	Woodland

However, whether these first arrivals were aware of shellfish as a food item is questioned by some:

It is not known exactly when people first realized the potential of the littoral environment in North America and began to exploit it ... Once the potential was discovered, people probably spread into this zone in a relatively short period of time [Will 1976:72].

Yet it appears plausible that Paleo-Indian bands moving northward along the shellfish-rich Atlantic coast brought knowledge of oyster food to the Hudson area without requiring a "learning period." Dumont suggests that, due to gradual shrinking of the spruce environment, "the Late Paleo-Indian intensified his exploitation of the previously marginally used

resources of fish and shellfish" (Dumont 1981:30). However, the earliest radiocarbon date of midden shell at present is 6950 ±100 years B.P. and stems from Dogan Point, verifying human consumption of shellfish during the Middle Archaic Period.

Exactly how shell middens accumulated is still uncertain. Many middens formed apparently during repeated occupations interrupted by yet undetermined time spans, but the mound build-up can be visualized best as a sequence similar to modern garbage disposal at the town dump: basketfuls of shucked shell were emptied at random - sometimes on top of heaps, other times at the flanks. The direction of approach, whim and strength of individual carriers, and the shape of containers and ground surface would each influence the

structure of the growing shell heaps. Any midden contents of equal depth even a short distance apart, are therefore not necessarily contemporary. The site analysis is further complicated by post-depositional movements through the coarse shell matrix, combined with erratic shell decomposition (Sanger 1981:40) as well as artifact intrusions into the shell heaps (Lenik 1977:106).

Oyster gatherers would have avoided camping directly on the jagged surfaces of fresh shell middens. "That campers lived on or within the mass of shell they were accumulating is simply not credible" (Brennan 1977a:137). Barber's report on the Wheeler Site is taking issue with this view by citing examples of modern shell middens from canneries: "A portion of the modern midden left undisturbed for a few months in warm weather will develop a substantial mat of weeds and grasses. This layer provides protection ...for the feet" (Barber 1982:12). Nobody will quibble with this observation, particularly since the shell content of the Wheeler Site consisted of the soft shell clam (*Mya arenaria*) which can be crushed by hand, whereas the Hudson middens are almost exclusively built up with the hardshell oyster (*Crassostrea virginica*) which at times was used as a cutting tool.

The plain fact remains that after hundreds of years of abandonment, some Hudson middens are still exposing the sharp-edged oyster shells, and few people would care to sit on them. "Aboriginal campers did not live on the shell heaps they themselves deposited, but on the surfaces of much older heaps or middens after these had been rendered occupiable by natural forces" (Brennan 1977a:126).

The size of oysters may at times be useful in separating depositional episodes. The G. O. Horizon (Giant Oysters, about 20 cm [8 in]) was nicknamed to designate the lowest layers of some Hudson middens and to use them as a common denominator for relative dating (Brennan 1977a:126). Shell size is not, however, a valid measure of archaeological age.

The shell middens bear witness to the consumption of enormous quantities of small morsels. Yet, collecting oysters and discarding the shells is time consuming. The time/distance norms for resources of hunter-gatherers are estimated as ten kilometers and two hours walking time (Bailey 1978:40). But in the case of oysters, different standards or methods suggest themselves. "In order to obtain even a small amount of food in terms of kilocalories, a considerable weight of live shellfish has to be collected" (Bailey 1978:41). The weight of 700 oysters would be approximately 25 kg (55 lb). "Assuming a bag load of 12.5 kg [27.5 lb], two trips would have to be made simply to supply sufficient kilocalories for the individual shell collector" (Bailey 1978:41).

Conceivably as a response to such factors, most shell middens were located within 50 m (164 ft) of the shore line. When the shucked oyster flesh was moved inland, it would weigh no more than 5% of the live oyster and occupy less space (Galtsoff 1964:21).

Shellfish gathering was apparently a regional practice among Northeast Indians. This activity is often

visualized as people on foot harvesting oysters. Yet Indians have used dugout canoes for oystering at least since Late Woodland times. The use of watercraft, however, for oystering may have been in vogue on the Hudson during Archaic times and might account for several Croton Point sites. A dugout canoe dating back to 3550 B.P. has been excavated in Ohio (Brose and Greber 1982:247), and even older craft were excavated in Florida. There has been no supporting evidence, however, for such Hudson River practice.

Kitchen Middens and Processing Middens

Prehistoric inhabitants of the Hudson Valley prepared oysters for their daily meals or processed them for storage. Kitchen middens are part of occupational sites where Indians dumped the oyster shells on middens jointly with bones, nut shells, and other food leftovers. Processing middens, on the other hand, resulted from a different activity: preparing shellfish for storage. Such middens usually encompass large volumes of shells but little else. They are located a fair distance away from camps and might be considered akin to big game kill sites.

Thus, in reconstructing past events, it seems possible to differentiate middens that are devoted to separate functions by several criteria: the size of the midden, the proportion of faunal remains, and the proximity to living sites or activity areas.

Size

A small lens of shell (e.g., 3 m [10 ft] square and 25 cm [10 in] deep) may consist of accumulations of "small heaps or discrete dumps from 5 to ... 12 bushels of valves ... best explained as the shell refuse of camping stopovers by a small band of perhaps, 10 to 20 persons" (Brennan 1981). At the other extreme, huge shell accumulations like those at Dogan Point (42 m [138 ft] long and 90 cm [35 in] deep) or "immense shell beds" at Hellgate (Finch 1909) and those of "several acres (Harrington 1909) do not suggest a few camping stopovers but rather substantial processing stations to provide this food item in larger quantities (Figure 3).

Faunal Remains

There is no indication that the diet of prehistoric inhabitants of the Lower Hudson Valley ever consisted solely of oyster meat. Kitchen middens may therefore contain faunal and vegetal debris mixed with the shell. The Twombly Landing Site produced, for example, about 2900 bones. It is also likely that additional faunal material from these daily garbage piles was removed by scavengers during the initial stages.

At large shell mounds like Dogan Point the faunal debris

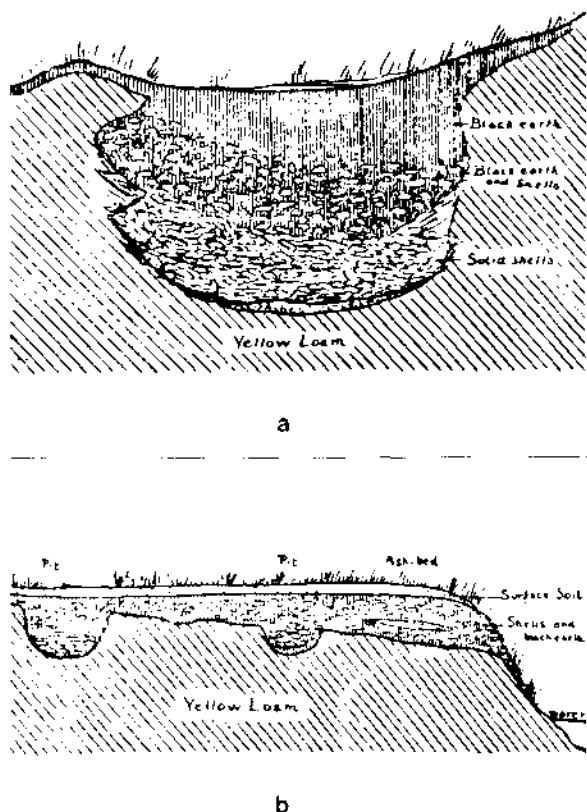


Figure 3. a. Cross section of a shell pit; b. diagram of a typical shell deposit. Source: M. R. Harrington, *Anthropological Papers of the American Museum of Natural History* Vol. 3, 1909.

figures only as an insignificant proportion of the whole. At the Kettle Rock Site near the northern end of Croton Point, the excavation of nine 1.5-m (5-ft) squares established that the shell ran 75 to 90 cm (30 to 35 in) deep. The site did contain "the bones and teeth of large browsing animals, deer and probably elk" (Brennan 1962:153). Unfortunately, there is no breakdown of the faunal remains. A few parts of one or two large animals, however, could be spread through the tested sections without characterizing the site as a kitchen midden. The indication that this site served as a processing station is given added credence by the observation that "we believe the present Kettle Rock midden to be the last, tiny remnant of a vast midden probably 50 to 60 acres in extent" (Brennan 1962:150).

Distance to Living Sites

Kitchen middens are part of habitation sites and frequently are associated with activity areas. The Twombly Landing locus included living sites and artifacts in close proximity to the shell middens (Brennan, Merritt, Wingerson, Merritt and Landauer 1970). The Kaeser Site contained traces

of bead working, leather preparation, and woodworking (Rothschild and Lavin 1977:80). At Castle Hill, Skinner located a shell heap composed of debris of wampum production (Bolton 1975:80).

By contrast, processing areas like Dogan Point would be located away from camping loci but adjacent to the dumping spots where the shell middens would rise. Hearths and artifacts were often at the original contact surface, indicating that occupation preceded the initial shell mounds. The Kettle Rock Site showed no trace of domiciles, activity areas, or diagnostic artifacts. Regrettably, the huge deposits referred to by Harrington and Fitch are no longer available for testing. However, neither were any living sites mentioned. Archaeological investigations found long ago that "heaps of shell, discarded when drying oysters for future consumption, often occur at a long distance from other traces of occupation" (Skinner 1909b:5).

The primary function of a shell midden site may be at times obscured by repeated occupation which may have also included camping after a surface became habitable again. Frequently, site information is too scanty to permit a clear picture of repeat visits: a section of the Parham Ridge Site consisted of "a slightly tilted flat about 40 x40 feet ... containing much decayed shell debris ... about 8 inches deep." Ultimately "later midden people ... left their shell in small dumps (about 5 feet in diameter)." There are no artifacts occurring, just some firecracked stone (Brennan 1962:144, 145).

The Wickers Creek Site at Dobbs Ferry apparently hosted both midden types. Early historical records place the Indian village at the mouth of the creek, about 0.5 km (0.3 mi) to the south. Several middens qualify as processing stations: shell accumulations up to 75 cm (30 in) in thickness, lacking faunal debris, are located a far distance from the reported village. Other smaller middens contain lithic debitage and burned bone. They are adjacent to post mold patterns and represent kitchen middens of occupational episodes.

Oyster consumption seems to have been more prevalent during Archaic times when hunter-gatherers may have supplied base camps, but that some shellfish processing continued into the Woodland stages seems indicated by a 60 m (197 ft) diameter midden near Port Washington where an Indian village once stood (Harrington 1909:176).

Meat from Shellfish

The pure and perfect way to eat an oyster is to have it fresh, raw and alive ... [Fannie Farmer Cookbook 1982:136].

It seems unlikely that the early inhabitants of the Hudson Valley could savor such delicacies before the Europeans introduced steel knives. The chief obstacle was that the bivalves could not be pried apart with stone tools. It has been suggested that Indians used flint spalls to cut the adductor muscle (Figure 4), or that burning faggots were applied (Brennan 1962:153; 1981:45). Such methods could, however, hardly account for the many millions of midden shells. Stone boiling in per-

ishable vessels made of basketry or skin could accommodate small quantities of oysters for daily meals but would only explain some kitchen middens at best.

It is commonly assumed that prior to Columbus the oysters in the Western Hemisphere were exposed to heat killing the oysters and relaxing the adductor muscle. The shells are almost always intact, except for deterioration, within the midden. The exact procedure for shellfish preparation remains enigmatic and probably differed with locale, quantities, and traditional practices.

Deep pits have long been credited with having served as baking ovens for shellfish. Harrington comments that "some pits are as large as ten feet wide by six feet deep, but the average is four feet by three feet. It is supposed that they were used as ovens or steaming holes and afterwards filled up with refuse" (Harrington 1909:170).

There are, however, serious considerations inveighing against such interpretations. No pits of any depth have been found in situ showing a stage of shellfish being cooked. Excavated pits are filled with empty shell, general garbage, or burials of man, dog, or sturgeon (Bolton 1975:82). They are often found underneath thick layers of shell which leaves in doubt how the oysters above were cooked.

The great depth and configuration of pits would appear to present difficulties in loading or unloading of oysters and fuel. Skinner observed already at Menomini sites: "It should be noted that the remnants of deep pits which dot their old encampments are more likely to prove to be caches for wild rice or corn, or holes dug to bury offensive rubbish" (Skinner 1921:102).

Indians were expert at handling controlled fires from hollowing out canoes to heat-treating lithics for projectile points. At the Lamoka Lake Site (an Archaic inland location), for instance, small fires were used for ordinary cooking purposes. "Their placement in shallow pits resulted in a concentrated column of heat, constituting an efficient and economical use of a small quantity of readily obtainable fuel" (Ritchie 1980:60).

Apparently, it does not require much heat to cause oysters to open. Exposed to the sun on tidal flats, oysters registered 46°C to 49°C (115-120°F) when small thermometers were inserted between the slightly opened valves (Galtsoff 1964:407). When the weather was favorable, the early residents may have resorted to the simplest method, leaving the gathered oysters in the open air for a few days. Apparently this weakens the adductor muscle (whose clamping power is up to 10 kg [22 lb]) sufficiently to permit easy separation of the bivalves (Galtsoff 1964:160, 176). Bone or wood tools used for opening would leave no visible traces on the shell.

Were oysters cooked in their shells or was the meat removed as soon as the bivalves opened? The shucked oysters might then be preserved in a variety of ways, including smoking by being suspended in nets from scaffolds as was meat or fish.

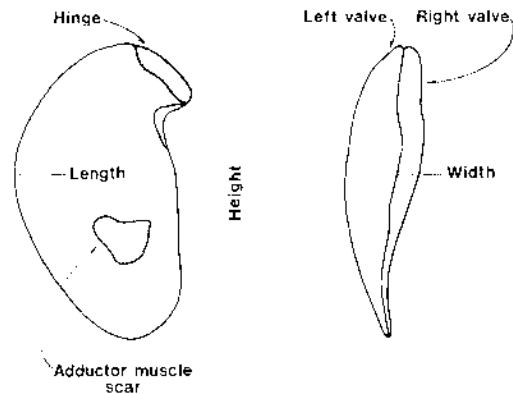


Figure 4. Standard terminology for oyster shells (after Galtsoff 1964).

It seems plausible that hunter/foragers would not bother to dig deep pits at the rocky Hudson shores if there were easier ways to cook oysters: for instance, by placing them on small ash beds akin to those at Lamoka Lake where "animal bones and artifacts were virtually absent" (Ritchie 1980:60). An alternate cooking method applicable to oysters was used by the Menomini, shallow sunken pits were often heated, the embers raked aside, then corn or other food was thrown in, covered with cold ashes and allowed to bake by the heat which remained in the ground (Parker 1968:60).

Little is known about oyster cooking during the Late Woodland Period, which seems generally to lack larger middens. Garbage pits in front of dwellings probably soon became filled with shell debris, indicating that new pits had to be dug at increasing distances from habitation (Bolton 1976:119).

At Archaic sites along the Hudson (e.g., Croton Point, Twombly Landing, Montrose, Crawbuckie) neither refuse nor storage pits were observed. "The only dug pits found have been 2 or 3 feet deep, narrow excavations full of charcoal, one of which yielded a C-14 date of 4750 years" (Brennan 1981:440).

Pits appear mostly associated with Woodland sites; the older a site, the fewer the pits encountered. One of the oldest and deepest shell heaps in New York, at Weir Creek Point near Westchester, seems typical: "Hearths and ash-beds were frequent, but pits were rare" (Harrington 1909:176).

The narrow pits filled with charcoal in the Hudson Valley and the ash beds noted at Throggs Neck may hint at the techniques used to process oysters for storage. The glowing embers could have heated substantial batches of bivalves for the few minutes needed to spring them open. There was no dearth of fuel near the shore. Heating of stones would not have been required which may explain the scarcity of fire-cracked rock near the shell middens. Low ash beds or shallow pits would

probably have quickly disappeared from shores or adjacent woods through erosion. Still, there is no direct evidence that the narrow pits filled with charcoal were actually used for oyster preparation.

Subsistence Considerations

The share of shellfish in the subsistence of prehistoric inhabitants fluctuated with the availability of oysters, alternate food sources, and food preferences. The oyster is a prolific animal, producing up to 50 million eggs per season (Hickman et al. 1979:288), but requires water salinity within a narrow range. In addition to many natural predators, oysters were prone to decimation by epidemics whose devastating effects were demonstrated in the summer of 1985 by the mortality rate in Delaware Bay. A deadly disease called MSX, caused by a tiny parasite, killed 41 % of the oysters, while another 18% fell victim to boring snails. According to the New Jersey State Bureau of Shellfish Research, "unusually high salinity levels resulting from this year's drought have created a hospitable environment for MSX and oyster drills" (New York Times, 24 Nov 1985).

Whether molluscs ever constituted a primary subsistence source is still debatable. Claassen submits, "The preliminary indication is that for hunters and collectors shellfish vary from a year round supplement ... to a seasonable staple (i.e., the Shell Mound Archaic sites), and was a seasonable staple for coastal horticulturists (pre-ceramic Peru, St. Johns II Period, Late Woodland, Georgia)" (Claassen 1986:33). However, other researchers do not share such convictions: "The ease with which molluscs can be overrated as a source of food will be swiftly appreciated from the fact that approximately 700 oysters (*Ostrea edulis*) would be needed to supply enough kilocalories for one person for one day, if no other food were eaten" (Bailey 1978:39). Furthermore, many essential nutrients seem lacking (Kraft 1986:78).

While Bailey's assessment of the role of the bivalves in food may be quite correct in substance, the amount of "required" calories is itself subject to disagreement. "It is hardly surprising that there are wide discrepancies among the estimates of human calorific needs used by prehistorians .. suggested calorific requirements range from 2000 to 10,000 per person per day" (Dennell 1979:126).

Even the supplementary share of shellfish meat in the subsistence of prehistoric groups would have fluctuated through time and season. Bailey noted that it would take 52,267 oysters (*Ostrea edulis*) to supply the calorific equivalent of a single red deer carcass.

The primary goals of procurement scheduling are to supply a satisfactory supply of food and raw materials while maintaining a reasonable balance between search and pursuit costs and harvest costs, on the one hand, and resource yields, on the other [Butzer 1982:259].

Dating of Shell Middens

It had been proposed that there were no longer any oysters in the Lower Hudson during the past 2000 years due to inadequate salinity, but in the light of newer findings this argument seems untenable. The vast shell beds around Oyster Island, which supplied the Manhattan and New Jersey Indians, were only formed after 2500 B.P. Indian ceramics were excavated early this century at Dobbs Ferry in context with shell middens, and the Half Moon was greeted with peace offerings of oysters by native inhabitants at Yonkers.

The rising sea level affected the oyster habitats of the Hudson shores differently from those of the New York coastal regions. Kaeser observed already that

archaeological evidence alone cannot explain in detail why the early isolated Archaic campsites of southernmost coastal New York are generally devoid of shellfish remains, while the numerous Woodland components reflect what appears to be an almost total involvement in shell-fishing [Kaeser 1974:17].

However, while sea water inundated the Continental Shelf, it turned the Lower Hudson into an estuary as ocean and fresh river water mixed, creating thereby favorable living conditions for hard shell oysters.

The gap in the present archaeological record for oyster consumption consists of missing Archaic dates for the river shores south of Yonkers and a similar void for Woodland consumption of these bivalves north of Twombly Landing. The lack of shell dates for Woodland times north of the New York City line may stem from the fact that previous research deliberately concentrated on dating the lowest level of shell middens in search of Archaic vestiges. Compounding the dating problems, shell middens southward from Yonkers were excavated early this century and attributed to Woodland origin. It is highly probable that at many sites the Woodland shells were superimposed on Archaic deposits. Until it became possible to date shell scientifically, there was no way to distinguish Archaic from Woodland shell heaps at Tottenville, Throggs Neck, or Croton Point.

Several radiocarbon dates from midden shell indicated already two decades ago that oysters were consumed during the Archaic Period in the Hudson Valley. The reinvestigation of the Dogan Point Site during the summer of 1987 verified Brennan's findings of such Archaic use of shellfish food (Claassen 1987). But there is not a single shell midden in the Hudson area which, to our knowledge, has been radiocarbon dated to establish the periods of deposition and frequency of occupations. By contrast, the Danish Ertebolle middens were scientifically dated and found to have been deposited over a period of four centuries (Bailey 1978:48).

Testing shell by the radiocarbon method can produce a narrow date range when applied with specific precautions (Arundale 1981), but this method dates neither a site nor a level; the date is that of the sample. "It is the task of the

archaeologist to discover the true relation between the sample and its source" (Johnson 1967:168).

An analysis of two dozen C-14 dates, all but four on shell (Brennan 1977b:412), indicates that several time ranges are overlapping. This raises the intriguing possibility that some sites (i.e., Dogan Point and Piping Rock) were occupied simultaneously. The campers may have been different bands living in close proximity or a single group moving between sites.

Social Aspects

The vast numbers of shells contained in middens raise the question of how prehistoric people may have organized their activities producing these middens. The Indians could be expected to use reasonably effective methods to gather and preserve large quantities of oysters.

Regardless of whether they used ash beds, fire-pits or other heat sources to prepare the bivalves, cooperative division of labor could have facilitated handling these animals which neither run nor bite. The work process may be visualized with the help of a hypothetical example:

	Person 1	Person 2
Collecting 50 oysters	10 minutes	
Round trip from shore to heat source	5 minutes	
Loading shellfish on heat source		4 minutes
Tending fire		1 minute
Removing opened bivalves	4 minutes	
Shucking with flint knife		3 minutes
Discarding empty shell		2 minutes
Drying of oyster meat		1 minute
Total	15 minutes	15 minutes

The operations above may be performed by any number of teams. Seasonal factors would modify such a schedule because icy oyster clumps could be harder to remove from beds. Similar cooperative activities have been documented ethnographically, as for instance, salmon netting in Alaska (Giddings 1985:302).

Efficient methods for oyster procurement would support the concept of the cooperative subsistence strategy which suggests "that each able participant of a littoral hunter-gatherer population has to ... collect resources that are available from a restricted area within that zone. Such resources are returned to the community, pooled together, and redistributed" (Will 1976:75).

Dried shellfish meat may also have functioned as a trade item similar to customary practices in the Pacific Northwest.

Those living along the immediate coastline had an abundant supply at all times, and they dried them, not only for use in winter, but also as an article of

barter with the people living further back in the mountains. Frequent mention is made of this barter. The interior people also made trips to the coast where they were permitted to collect shellfish and other sea foods for themselves on the beaches and rocks of their friendly neighbors [Kroeber and Barrett 1960:110].

The Lower Hudson Valley may not have witnessed such extensive trading, but "the custom of drying oysters for preservation was well remembered by the Shinnecock Indians of Long Island in 1902. They claimed to have paid tribute to the Iroquois in these" (Skinner 1909b:4).

The processing of oysters appears to have been a Hudson Valley adaptation of both Archaic and Woodland inhabitants. "Multiple reoccupation of the same location may record repeated residence at centrally located base camps or periodic/ seasonal exploitation at resource specific sites near ... aquatic/ marine habitats" (Butzer 1982:231).

Conclusions

The Woodland Indians and their Archaic ancestors of the Hudson Valley consumed oysters whose accumulated shells are now the landmarks of prehistoric life styles. But these ancient inhabitants seemed to have engaged in substantial oyster processing meant for storage, a Hudson Valley adaptation, separate from their shellfish collecting for daily meals.

The processing middens resulting from this activity may simply indicate provisions for storage. Their existence, however, may indicate also shellfish collecting as a chore for base camps further inland, and the possible participation in a regional exchange system.

The locations and size of the shell middens appear to point to a diminished use of oysters during the Late Woodland Period due to various causes. For instance, the "Little Ice Age," which dropped temperatures 1500 years ago, made shellfish collecting conceivably more difficult during additional months. Oysters may have also lost some of their attraction despite their availability, as did acorns, when alternate foods were found to be tastier, healthier, easier to procure, and easier to prepare.

Direct evidence is lacking about oyster preparation in prehistoric times, but deep pits, frequently assumed to have served such purpose, do not appear adequate. Oysters are more likely to have been cooked by placing batches of bivalves in narrow, shallow pits or on hot ash beds. The implied sharing of work as part of oyster processing suggests egalitarian relations and may ultimately have been reflected in communal aspects of Algonquin lifeways.

Scientific advances of the past few decades permit now the extraction of a crucial body of information from the shell middens which neither lithic artifacts nor potsherds can yield. The new data help to explain the lifestyles of prehistoric inhabitants and lend greater precision to the chronologies of the Lower Hudson Region.

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The Meier Site: A Chert-Knapping Workshop at Flint Mine Hill, Coxsackie, New York

Michael F. Laccetti, Van Epps-Hartley Chapter

The Meier Site, a workshop for processing cherts into early Susquehanna Tradition blades is described. A Late Archaic Stage affiliation is suggested.

Introduction

Located on the USGS 7.5' Coxsackie, NY Quadrangle topographic map, Flint Mine Hill has long been known as an intensively worked aboriginal lithic resource. The chert-knapping workshop under discussion is situated on a knoll immediately south of the Meier farm homestead and rests on the folded chert and shale of the Mount Merino Formation of the Normanskill Group (Early Middle Ordovician age) (Fisher 1977: Correlation Chart; Goldring 1943:102).

Excavation Methods

Within each square meter of a grid system aligned north and south, balks of 20 cm (8 in) in thickness were established. Each grid section excavated measured 0.80 m square (8.6 sq ft), and the unexcavated walls facilitated horizontal and vertical measurements and preserved the stratigraphy of the site. Horizontal and vertical positional measurements of the cultural finds were taken at 5-cm (2-in) arbitrary levels. Twenty-seven such squares were excavated. Fine and coarse screening of the fill from each square yielded flakes from a few millimeters to several centimeters in length, resulting from pressure and percussion chert-knapping techniques. All chipped stone artifacts are of local Normanskill cherts. The maximum depth of the workshop site deposit was found to be 60 cm (24 in). A soil profile sample was removed from grid section W2S4.

Interpretations

Soil Analysis

The soil profile of the site is characterized by a coarse, loamy pedon typical of the ridges in the Hudson Valley. Two soil horizons were identified, one a humid A horizon having the least total silt, and a B1 horizon having the most and the finest clay in its layers. Both the A and the B1 horizons have the same inorganic constituents. Site soils were initially disturbed by workshop activities which left heterogeneous but

uniform soil layers containing tools, shale detritus, and chert debitage. Chemical changes in the soil horizons over a long period of time are evidenced in the differing soil environments of the black, organic humic horizon A and the lower red B1 horizon.

Horizon A, 13 cm (5.2 in) in depth, contained the heaviest concentration of workshop tools. Heavy utilization of horizon B1, 23 cm (9.2 in) in depth, was indicated by large, coarse chert spalls and fragments of grit and quartzite hammers. From 30 cm (12 in) in depth, the heavy deposition of detritus and industrial debris diminished down to bedrock where chipped stone was infrequent. The distribution of artifact types remained typical throughout the strata while the number diminished with depth.

Uniface Lithic Technology

The Meier Site assemblage of artifacts represents both chipped and rough stone industries. The first, with patterned technological practices, may be described according to a uniface typology based on form and technological traits (Crabtree 1972:97). These unifacial tools had their greatest concentration in the 0-25 cm (0-10 in) levels (Table 1). They are characterized by use-modified working edges on the central planar surfaces of flakes or spalls, a feature found on edges of other simple tool forms at the site. Many heavily utilized flake scrapers with single or multiple use-worn edges appeared in combinations with other single-feature tool types (e.g., the spokeshaves, denticulate side scrapers, end scrapers, and notched tools). The spokeshaves at the Meier Site are characterized by concave working edges with closely standardized width-to-thickness ratios of 2:1-3:1, differing from the 4:1-8:1 width-to-thickness ratios of heavier notched uniface tools (Figure 1 a and t). Comparable measurements of spokeshaves and notched tools are found in samples from other aboriginal regional quarries and open sites in the Mid-Hudson region. Like those single-feature unifacial tools appearing as multiple tools or in combinations of working edges at the Meier Site as multi-purpose tools, these various features also appear on other quarry, riverine, and inland stream open site tool inventories. While suggesting repetitious and sequential manufacturing operations, both the multiple and multi-purpose tool forms at the Meier Site had low frequencies in the upper strata and appeared only in a few instances as members of tool aggregates.

Table 1. Uniface tool frequencies at arbitrary levels.

Stratigraphic Intervals	cm	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	Total
	in	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	
Bifacial Products														
Asymmetric, massive chert core									1					1
Massive, biconvex chert core										1				1
Rough, unifacial blade stage fragments		6	1											7
Plano-convex, ovate, biface configurations						1								1
Rough, incomplete, biconvex biface stages		1		1	1	1								4
Rough biconvex biface configuration fragments		6	3	11	2	2	1			1				26
Rough, large, early ovate blade stage fragments				1	1				2					4
Rough, small, ovate biconvex blade stages		2	2	1		1								6
Rough, small, ovate biconvex blade stage fragments			1											1
Rough, complete biconvex blade stages		1	1	1	1				1	1				6
Well-developed, biconvex blade configurations				1										1
Bi-convex blade configuration fragments				2	3	2	5			1				13
Rough, asymmetric ovate blade stages		1			1									3
Rough, ovate bifacial blade fragments		1		6		4	2							13
Rough, complete, ovate blade configurations									1					1
Small, ovate blade configurations		1												1
Complete, small ovate knives		2												2
Complete, small, asymmetric ovate knives		1												1
Complete, short ovate knives		2												2
Complete, small ovate blade fragments		7	1			1	1							10
Mature, large, ovate blade fragments		12	15	25	15	18	7	1	4	1				98
Early, biconvex lanceolate blade stages			1											1
Complete, lanceolate biconvex configurations						1								1
Advanced, lanceolate, blade stages			1											1
Well-developed lanceolate config., lobate stems				1										1
Complete lanceolate blades				1	1									2
Mature, lanceolate blade fragment			2	3	1	1								7
Contracting stems		1						1						2
Semi-lozenge stems					2									2
Lobate stems, broad knife remnants				3										3
Asymmetric, lobate stems			1											1
Weakly lobated stems			1											1
Asymmetric, semi-lozenge stems				1										1
Tapered stems, straight bases				2										2
Bifacial side scrapers			1	1		1								3
Bifacial backed blades						2								2
Drill, fragment		1							1					2
Projectile point, Paleo-Indian, fluted											1			1
Rough Stone Implements														
Percussors: Hammerstones, spheroidal, pebble		2	2	2	1	3						2		12
Hammerstone remnants		3	3	2	1	2	1					6		18
Hammerstones, bipolar			1											1
Fabricators: polled, wedge hammerstones			4											4
discoidal, thin quartzite		1	1	1										3
discoidal, thin remnants				2	1	1								4
abraders, grit, quartzite		1		2		2								5
abraders, massive, grit, quartzite fragments				1	1									2

Workshop debris was utilized in the chert-knapping processes. Spokeshaves were shaped on bifacial-knife remnants or large spalls, notched tools were based on large rough spalls, and dentate tools were fashioned on flat planar surface edges of spalls or on rough biface fragments. Simple scrapers on flakes and linear spall edges were heavily utilized. Tools were also based on large, thick, primary flakes derived by percussion or flakes derived by secondary retouch (Crabtree 1972:85, 89).

Uniface tools exhibit varied kinds of use-wear resulting from varied tasks performed in the workshop. Spokeshave working edges are lightly abraded in contrast to the more massive, heavily abraded notched tools which have wider and deeper concavities designed to perform much heavier tasks. Denticulate tool edges appear suitable for striating soft materials, and tipped tools seem adequate for graving.

Biface Lithic Technology

Excavation of chert bifacial products heavily concentrated between the surface and 30 cm (12 in) below has revealed a developmental reduction sequence in which workshop products were made into bifaces (Table 2). This lithic series is evidenced in a progression of forms initiated by hard percussion of a chert core into a rough unifacial form, which was then further modified by percussion techniques into an ovate or a lanceolate biconvex configuration. More elaborate knapping techniques such as indirect percussion for thinning, flaking by secondary retouch, and pressure flaking for greater uniformity were also used in making a finished product (Crabtree 1972:11-16).

Bilateral sinuous edgewear on rough, bifacial ovate blades and on other intermediate to well-developed biface blade forms indicates their on-site usage during the manufacturing process. Breakage on both rough and mature blade forms by hard workshop usage is evidenced in the Cocksackie workshop debris as well as some well-developed blade remnants with transverse fractures resulting from end shock (Crabtree 1972:60).

Other aspects of technology in producing flakes at the site are suggested by the kinds of flakes recovered from workshop debris. Products of biface-knapping techniques include hard percussion flakes derived from the removal of the rough cortex of a chert core and have wide striking platforms and undulations that are large and widely spaced on ventral flake surfaces. Retouch flakes formed by indirect percussion have small striking platforms and are of a standardized size and shape (Crabtree 1972:11-13). Coarse, hard-percussion flakes and biface core-thinning flakes are readily identifiable at the Meier Site.

The analysis of flakes and flaking techniques from the Cocksackie Site has also been facilitated by the categorizing of retouch flakes removed from bifacial knives and unifacial tools dulled by use (Frison 1968:151).

These flakes are lenticular in transverse cross-section and have faceted striking platforms. A percussion technique is indicated by a definite overhang on flake bulbar faces. Retouch flakes fitting these categories at the Meier Site have light grinding on opposite sides of small but clearly defined overhangs on the bulbar surfaces. Other retouch flakes show marked crushing or obliteration of striking platforms resulting from the forces of percussion or heavy usage; deep dulling extends down the exterior flake surfaces.

The types of typical retouch flakes at the site include those with an overhang and striking platforms faceted from their usage, and those without faceted platforms but with what appears to be wear usage or abrader grinding. Under 10X magnification, one type of flake shows no sign of dulling or abrasion on its striking platform and may derive from the sharpening of new or unused biface blades. Other flakes lack the percussion-formed overhang, are characterized by elliptical or trianguloid striking platforms, and have straight-sided trianguloid striking platforms and straight-sided trianguloid cross-sections of their lengths. Cones of percussion are not present on their striking platforms. Chert cortex is present on the sides of the flakes which suggests their derivation by an overlapping percussion sequence. Wear on the triangular-sided lengths indicates their usage as simple scrapers or straightedge flake knives.

Multiple flakes are present in the flake assemblage and are attributed to a series of step fractures with superimposed positive and negative bulbs of percussion. They either have been struck from a core from which a primary flake has been previously struck or were produced simultaneously with the primary flake. The broad area of contact between percussor and core implies the use of a blunt hammerstone (Jelinek, Bradley, and Huckel 1971:198-200).

The use of a soft-hammer technique at the Meier Site is indicated by the unifacial retouch flaking of side- and endscraper edges while their flat sides remained unmodified (Figure 2a, d, and f). Retouch flakes of the end-scraper (Figure 2d) may appear similar to scraper retouch flakes, but endscraper retouch flakes may be faceted and include ridges between flake scars (Frison 1968:152).

For processing raw Cocksackie cherts, a hard-percussion technique was the dominant mode of flake production at the Meier Site. Detached from a chert core by spalling, the flakes are characterized by their distinctive bulbar scars, prominent Hertzian cones, and bulbs of percussion on the fracture surfaces of the flakes (Speth 1972:35). Use-wear on these hard-percussion flake edges indicates their use as simple knives or scrapers at the workshop. From the debitage a total of 900 flakes were recovered and categorized. Deliberately altered or broken and discarded chert fragments and flakes that could not be categorized because they were unidentifiable remnants (many with edge-wear usage) brought the total number of worked chert remnants to 1700.



Figure 1. Unifacial tools from the Meier Site. a) spokeshave; b) dentated side scraper; c) notched tool; d) denticulated tool; e) tipped tool; f) massive notched tool; g) multipurpose tool (side scraper-dentate); h) multipurpose tool (dentated side-spokeshave); i) multiple tool (spokeshave-spokeshave).

Table 2. Stratigraphic distribution of bifacial products and rough stone implements.

Stratigraphic Interval	cm	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	Total
	in.	0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24	
Spokeshaves		28	18	14	12	7	4	2	1					86
Spokeshaves on bifacial blade remnants			5		1									6
Denticled side scrapers		16	12	12	1	1	2		2					46
Denticulate		3	2	5	1	1	1	1						14
Noched		13	7	7	4	1								24
Tipped		2		1			2							5
Multiple spokeshaves		2	2			1								5
Multiple notched		2	2											4
Multipurpose		2	3	2	5	3								15
Scrapers: simple, use-retouched		83	24	44	24	18	15	7	1					236
Simple, percussion retouch		7	5		2	5		1						20
Convex, percussion, pressure flaked		3	6	1	5									15
Linear side, percussion, pressure flaked		5	1	5	3									14
End, percussion flaked		3	3	4		1								11
Massive end, percussive flaked					1									1
Massive side, percussion flaked					1									1
Ovate, unifacial blades				1										1
Rough, ovate, unifacial blades		2	7	4		1		1						15
Rough, unifacial backed blade remnants				1										1
Unifacial backed blades, small		2												2
Retouched flake blades, excruciate			1											1
Cores, nondirectional		5	2	6		2	4							19

Stratigraphy and Industrial Patterns

The spatial distribution of assorted tools and implements appeared to be random in most stratigraphic levels. Sixteen groups of hard percussion-derived reduction flakes occurred. The frequency of tool and implement utilization in the context of stratigraphic levels emerged with the greatest occurrences of unifacial tools as 32 times, blade and blade remnants 19 times, hammerstones and hammerstone fragments 25 times, abraders and abraded remnants 9 times, and an auxiliary rough stone implement once. Eight flake clusters within the 0-30 cm (0-12 in) stratigraphic interval were composed of use-worn, hard-percussion flakes or biface-thinning flakes.

Rough Stone Industry

Serving as fabricators of chert cores in the biface reduction sequence, the roughly spheroidal quartzite hammerstones used have masses ranging from 50-350 g (0.11-0.80 lb) with a mean mass of 238 g (0.52 lb). The smallest hammerstones were found in the 0-25 cm (0-10 in) intervals. Those with the greatest masses, 325 g (0.72 lb) and 250 g (0.80 lb), were recovered within the 50-55 cm (20-22 in) intervals without other associated stone items. Remnants of heavier hammerstones at these deep levels indicate coarse difficult reduction of cherts. A lanceolate projectile point (Figure 3h) found within grid square E3S4 at 46 cm (18.0 in) has neither chipped nor rough stone associations. Not belonging to the workshop assemblage is an earlier Paleo-Indian fluted point with a

characteristic ground base (R. E. Funk, personal communication).

Affiliated with the Coxsackie workshop are abraders used to prepare striking platforms to facilitate the removal of flakes by indirect percussion (Crabtree 1972:13). Fabricators used in the direct freehand percussion technique of biface reduction include hammerstones (Crabtree 1972:11). The implements found in the workshop intervals of 5-35 cm (2-12 in) are of quartzite, which resists fragmentation, and are often nearly spheroidal. A bipolar hammer form can serve as a knapping tool to direct a force through its long axis against a mass of chert. Other quartzite fabricators include semi-circular hammers, with their unprepared or prepared polls opposite thin bits formed by hard-percussion spalling, and discoidal hammers with uniformly circular wear on their bits shaped by hard-percussion spalling of one or both faces. The wear patterns on both these forms are confined to thin widths on their bits.

Cluster Analysis

Arrays of unifacial and bifacial elements occurred in small concentrated loci within the horizontal grid sections of the site. While aggregates of tools and implements seemed randomly dispersed in different levels, the arrays of tools and implements were found in distinct areas in the upper stratigraphic levels (0-20 cm (0-8 in) and then diminished in number from 20-35 cm (8-14 in) levels to the 40-60 cm (16-24 in) levels.

Five defined groups of unifaces, bifaces, and rough stone



Figure 2. Unifaces from the Meier Site. a) unilateral side-scraper; b) simple side-scraper; c) side-scraper on a prismatic spall; d) oblong side-scraper; e) side-scraper (backing retouched dulling) on a hard-percussion flake; f) end-scraper retouched on a hard-percussion flake; g) carinated end-scraper; h) retouched linear side-scraper; i) unifacial ovate blade; j) blade on a hard-percussion flake; k) unidirectional core.

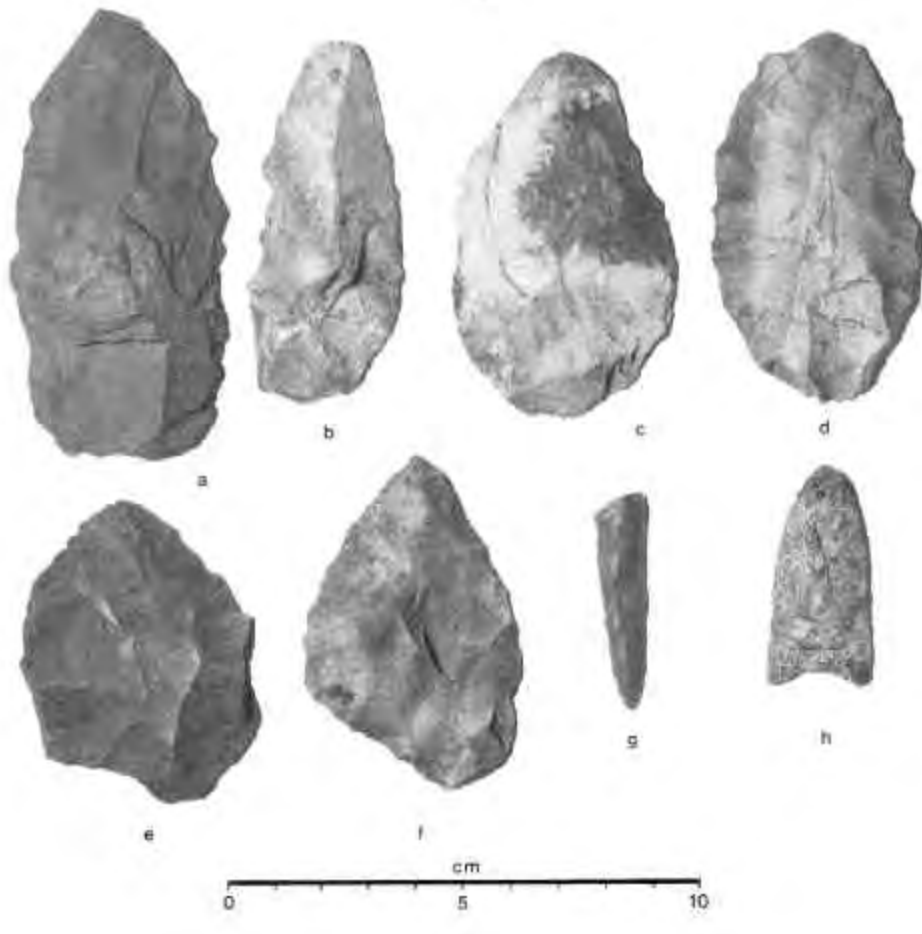


Figure 3. Bifacial knives and projectile points. a) lanceolate knife, straight base; b) lanceolate knife; c, d) ovate blades; e) short, ovate blade; f) asymmetric bifacial blade on a hard-percussion flake; g) drill fragments; h) Paleo-Indian fluted projectile point.

appeared in clusters (Figure 5). Cluster 1 was ellipsoid, encompassed squares W1S0, W1S1, W2S1, W2S2, and contained four aggregates of 11 tool and implement members. Unidirectional flaked cores occurred in 0-13 cm (0-5.2 in) levels and formed related sets with hammerstones. Flake scars on the cores suggest special use for derived unifacial blades. An ovate blade (Figure 3c) was associated with a hammerstone at 8 cm (3.2 in). A large, broadly lobate blade (Figure 3e) was found with a simple use-retouched side-scraper (Figure 2b) and a unidirectional core (Figure 2k) at 13 cm (5.2 in).

Cluster 2, with six aggregates of 36 members contained within the E3S 1, E2S 1, E1S2, and E2S2 grid sections, was also ellipsoid. Two unifacial tool members were present in an aggregate with an ovate blade at E3S1 at 0-5 cm (0-2 in) and may relate to another ovate blade in E3S0, at 8 cm (3.2 in). A contracting-blade stem remnant (Figure 6b) was present at the same level as the ovate blades. A lobate stemmed bifacial blade (Figure 6i) represents an aggregate in E3S1 which

contained a number of unifacial and bifacial products in the 0-10 cm (0-4 in) interval. At deeper 10-15 cm (4-6 in) intervals, the E2S2 square contained an aggregate that included a quartzite discoidal abrader (Figure 4b) near a lobate straight-base blade (Figure 6k) which appeared to be associated with a semi-lozenge-blade stem (Figure 6d) and a contracting-blade stem (Figure 6a) at the 10-20 cm (4-8 in) levels and also with aggregates within the E2S2 square horizontal context. At the end of the ellipsoid cluster in E1S2, an aggregate consisting of a bifacial blade stem, unifacial tools, and a massive chert core (1.84 kg or 4.0 lb) was isolated at the 30-35 cm (12-14 in) interval.

Cluster 3 was densely concentrated in one grid section, E2S3, and consisted of six aggregates of 29 worked stone items. Except for four items present at one end of the tightly formed cluster at 7 cm (2.8 in), the aggregates were found in 15-25 cm (6-10 in) depths. One of the aggregates contained a

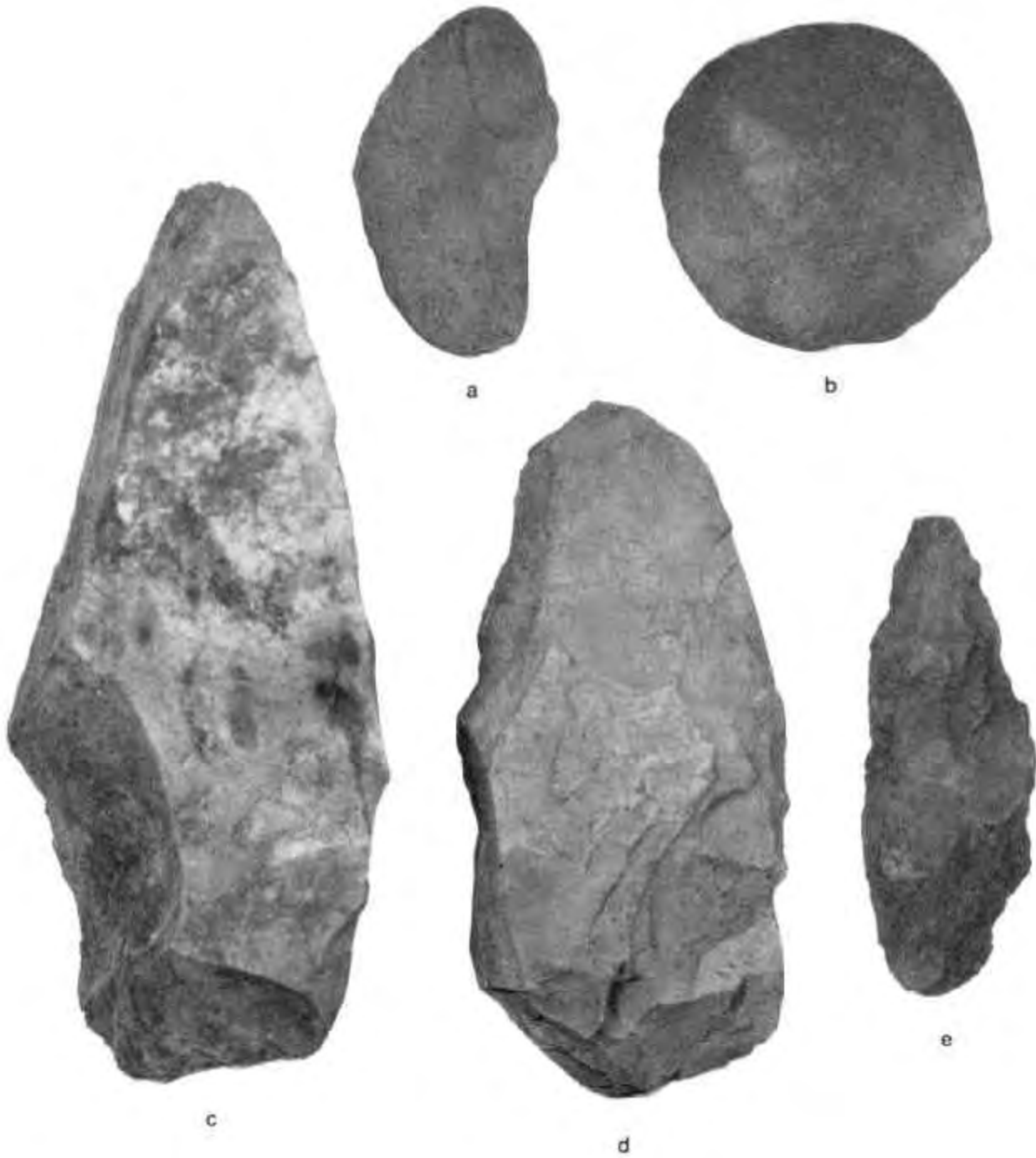


Figure 4. Biface reduction sequence, implements and products. a) grit abrader; b) quartzite discoidal abrader; c) possibly crude, early asymmetric lanceolate blade stage; d) piano-convex ovate reduction configuration; e) in-process lanceolate blade stage.

W350	W250	W150	E150	E250	E350
		N T UC			
W251	W251	UC H H O H ①	E151	E251	E351
				NES T O SS B P M MM P FB N BB N B ES	SS
	W252	W152	E152	E252	E352
	SS P UC		UC SS P P N B T BP	B O P T SS A N B T	
	W253	W153	E153	E253	E353
				③ O H T B SS H D C B SS H H B M M A T B T H B M A T B T	B B SS B
	W254	W154	E154	E254	E354
		F T SS B M T	B BP N SS P N N H F SS ⑤	P BP	O F B SS P PN T N N P SS SS N B ④
UNIFACES			BIFACES		
T	dentate	C	assymetric, massive chert core		
	denticulate	BP	bifaces in process		
	tipped		massive chert biconvex configuration		
N	spokeshave		possible early biconvex lanceolate stage		
	notched		advanced lanceolate blade stage		
M	multiple	O	possible ovate or lanceolate blades or knives		
	multipurpose	B	biface and blade fragments		
ES	end scraper	BB	backed blades		
SS	side scraper	D	drill fragments		
F	flake cluster	P	lobate contracting stem blade or knife		
FB	flake blade				
UC	unidirectional				
	Flake cores	A	abraders		
		H	hammerstones, fragments		
			ROUGH STONE		

Figure 5. Chipped and rough stone clusters.

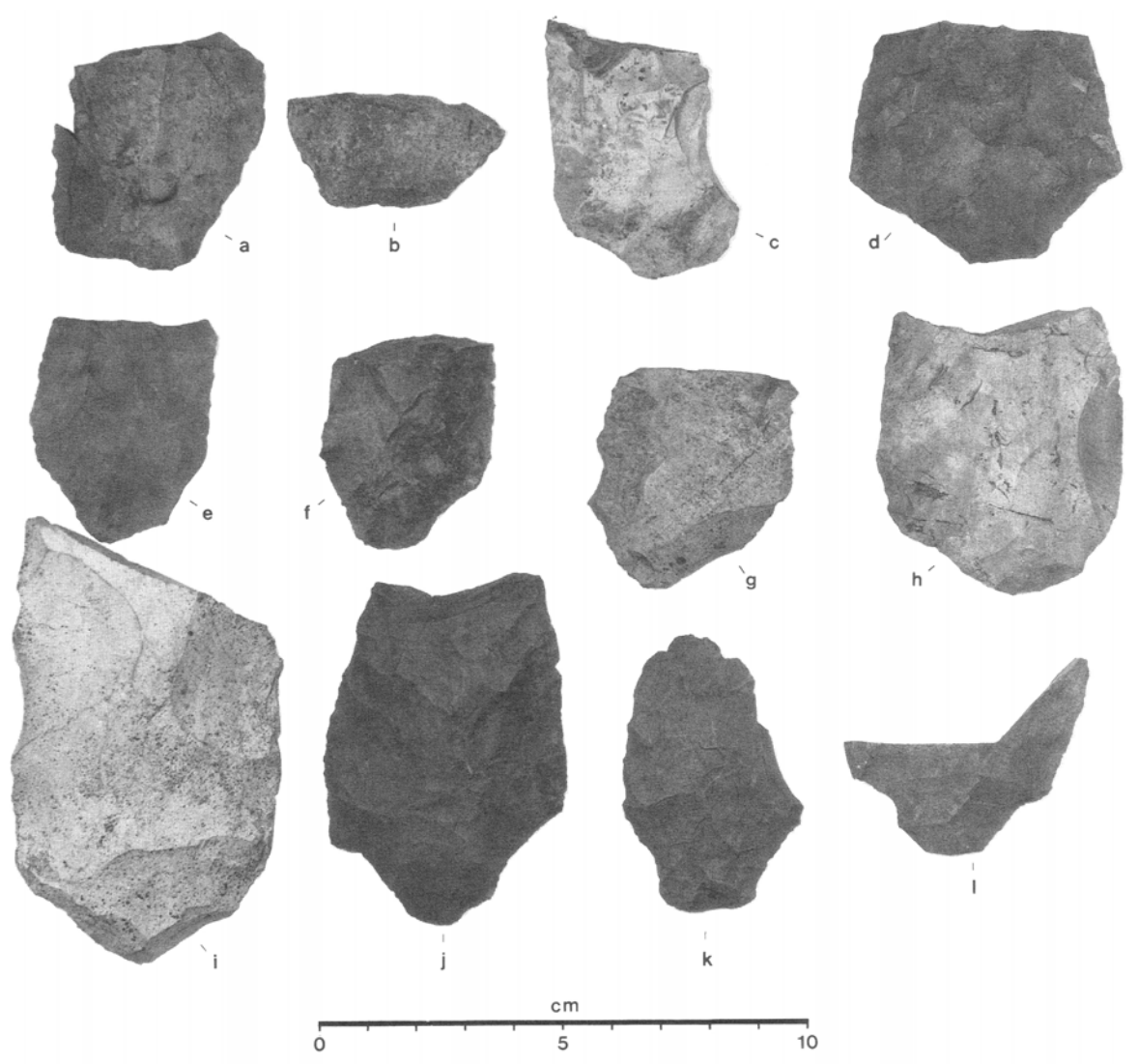


Figure 6. Meier Site knives, broad spear and projectile point traits. a, b) contracting stems; c, d) semi-lozenge stems; e) asymmetric semi-lozenge stem; f, g) asymmetric and weakly lobated stems; h-j) lobate-stems; k, l) tapered stems, straight bases.

grit abrader (Figure 4a). Like the isolated aggregate found in E1S2 at 30-35 cm (12-14 in), an aggregate consisting of bifacial blade remnants, a stone drill fragment (Figure 3g), and a chert core (2.2 kg or 4.4 lb) in E2S3 was at a deeper, 30-35 cm (12-14 in) interval than were the other aggregates in E2S3. A small distant aggregate at 7 cm (2.8 in) in E3S3 appeared unrelated to the E2S3 cluster.

Cluster 4 consisted of three aggregates whose 17 members were confined to one grid section, E3S4, and were distributed throughout an apparently semi-circular area. Within the 0-10 cm (0-4 in) interval, an ovate bifacial blade was accompanied by a bifacial blade tip, a simple scraper, and a flake aggregate at 7

cm (2.8 in). Slightly lower at 10-20 cm (4-8 in), an asymmetric semi-lozenge stem in E3S4 (Figure 6e) occurred on the same level as a lobate stem-blade remnant and an in-process lanceolate blade (Figure 4e) in E2S4. Two lanceolate blades (Figure 3a and b) also occurred within the 10-20 cm (4-8 in) intervals with unifacial and bifacial elements and an aggregate of use-retouched flakes.

Cluster 5 consisted of five aggregates of 22 members contained within grid units E2S4, E1S4, and W1S4. Three aggregates were contained in E1S4, and two of them were flake clusters within the 0-10 cm (0-4 in) interval. Isolated from those features, a third flaking station was found in W1S4 at 20-30 cm

(8-12 in) and like the other flakes in E1S4, where a heavy concentration of unifacial tools occurred, the flakes suggest use as simple knives or scrapers. An asymmetric lobate-stem remnant (Figure 6g) was found at 10-15 cm (4-6 in) at nearly similar interval depths as the lanceolate blades in Cluster 4. A crude, possibly asymmetric lanceolate blade stage (Figure 4c) and a lobate knife-stem remnant appeared isolated at 35 cm (14 in).

Generalizations

A population unit of perhaps one or two nuclear families during a significant length of occupation is indicated by the large quantity of waste and worked cherts from nearby available exposures. Within the clusters evidence for some degree of task specialization is seen, and the similarity of tools in different levels throughout the site indicate little function variation in the wide range of tools present. The inferred purposes of these tools, which occur gathered together or discarded together, are scraping, perforating, striating, cutting, piercing, abrading, and hammering. Evidence for the use of scrapers on wood and hides and the presence of a stone drill fragment (Figure 3g) suggest the importance of woodworking at this workshop in hafting tools, producing shafts, or perhaps manufacturing weapons (R.E. Funk, personal communication).

Conclusions

Straight bases and contracting, semi-lozenge, lobate, and asymmetric stems in the chipped stone assemblage of the Meier Site express cultural affinities with Susquehanna forms (Witthoft 1953:31). Similarities between the Cocksackie workshop materials and the straight and contracting bases of the Snook Kill Site projectile points as well as the broad-bladed flint knives of the Weir Site suggest an affiliation with the Snook Kill Phase within the very Late Archaic Stage previously described by W.A. Ritchie (1971, 1980) and Robert E. Funk (1976).

The Meier Site is a workshop for processing cherts into early Susquehanna Tradition blades. Further interpretations of the Meier Site broad-blade and stem traits relate to changes in stem styles within the patterns of evolving projectile points (Figure 6), beginning with Susquehanna Broad points of c. 1750 B.C. and undergoing changes at c. 1300 B.C. to a final form as the later fishtail projectile point of c. 1000 B.C. (R.E. Funk, personal communication).

The bifacial and unifacial chipped stone morphological attributes of the industries at the Cocksackie workshop also appear as recurrent attributes of form in the chipped stone complexes of other eastern and western lowland quarry, riverine, and inland open sites in the mid-Hudson region. The Meier Site, a component with a Susquehanna Tradition, is a locus of previously undescribed unifacial and bifacial technologies of relevance to interpretations of aboriginal cultural patterns in the Hudson River Valley.

Acknowledgments

Permission granted by Mr. and Mrs. Herman Meier to excavate the site is gratefully acknowledged. The writer is especially indebted to Robert E. Funk, New York State Archaeologist, for his many helpful suggestions and interpretations. Thanks are extended to William Broad, U.S. Soil Conservation Service, Greene County, New York; K.R. Olsen of the Soil Characterization Laboratory at Cornell University, Ithaca, New York, for the site soil analysis; and Larry Day, U.S. Soil Conservation Service, Walton, New York, for further interpretations.

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Review

Wampum, War, & Trade Goods, West of the Hudson

Gilbert W. Hagerty. Heart of the Lakes Publishing, Interlaken, New York. 1987.

Pp. 299; 8 maps, 112 black and white photographs, 160 drawings, references, index. \$40.00 (cloth).

This is a most unusual book, running the gamut from the sacred to the profane. The elegance of the prose is befitting this former teacher of English and the speech arts. Indeed, the writing at times, in its melodic meter and rhythm, becomes poetry.

Mohawk war parties shrouded themselves under the thick grown brake along the streams where the Huron fur fleets passed, shot forth lightning from their arquebuses, and swift as shadows, snatched from the Huron the rich argosies of fur coming out of the northern wilderness again and again [p. 139].

Gilbert Hagerty was a scholar of the first order. He grew up in the Mohawk Valley and as a child was educated in it. He attended Ithaca College for his undergraduate work. His graduate studies were done at St. Lawrence University and Syracuse University after which he began a teaching career in the Valley for a period of 33 years. His interests in its history and archaeology are reflected in his many addresses across five states to both public and professional organizations and gatherings. These interests are mirrored, too, in his writings, which range from an erudite, yet remarkably palatable series on the archaeology of New York State in the Rome Sentinel newspaper, to a spellbinding story focusing on a French and Indian Wars disaster, his book, *Massacre at Fort Bull*.

It is understandable that learned organizations wished to bestow honors upon this distinguished researcher. He received such awards as the Oracle Key from Ithaca College, The New York State Commission of Historic Observance's gold medal (which included a study period in the Netherlands), the Medal of the Order of 1777 by the Rome Historical Society and the award of Fellow by both the Company of Military Historians and by the New York State Archaeological Association.

This present volume, Gilbert Hagerty's final work, has been published posthumously, appearing in 1987, three years after the author's death. It is the culmination of some 50 years of research. During that time, Hagerty built an enormous reference library on archaeology and history. He also became personally involved in many archaeological investigations. These included his own work on the Oneida Carry at Wood Creek, at Fort Bull, on which he wrote so authoritatively, as well as on a variety of Mohawk villages, some of which have major historical significance, including the martyrdom of a member of Jesuit priesthood, the religious as well as political emissary to the Mohawks, the Reverend Father Isaac

Jogues. Hagerty's devoted archaeological and historical interests led him, as Director of the Fort Stanwix Museum in Rome, to provide substantial support for this reviewer's investigations of a multicomponent Mohawk cemetery at Fort Plain as well as of an Onondaga cemetery related to the Onondaga capital attacked by Count Frontenac's forces of some 1000 Frenchmen and 400 Indian allies in 1696.

It was Hagerty's aim, in this present volume, to synthesize "... archaeological finds with documentation from the Dutch exploration of the Valley in 1634-35, the Isaac Jogues story, and the French destruction of Mohawk villages in 1666" (p. vii). Hagerty further notes "This book is written for those who are not interested in archaeological site reports but for those who would like to understand better the role of archaeology as it relates to documentation and evidence in unfolding some of the secrets of those who made Mohawk Valley history and to spark their interest to explore further" (p. vii).

It is indeed a very different sort of book. In some ways it may remind the reader of certain of the popular writings of Ivor Noel Hume on Colonial Williamsburg, especially of Wolstenholme Towne. Yet, there is an aura of mystery and suspense that pervades Hagerty's writings that is almost awesome as events of the past are relived, sometimes in the first person and always with a gripping, sometimes insidious and even mystical quality. The feeling for what is to follow is eloquently stated in the succinct Introduction:

In the broad sky that spread over the land, the Indian had placed spirits. That of the docile fawn was placed in the south to breathe warm air over the hills and valleys. From the east the moose snorted out fog and mists. Sometimes the angry panther in the western sky sent harsh strident winds and sharp gales across the hills, while the great bear in the north breathed the cold and chilling winds that brought deep snows.

Whichever wind blew, the Indian accepted as a part of his life. With the first warm breath of the fawn he planted his maize. The fog and mists of the moose tempered the hot days that followed. When crops were harvested, the breath of the panther told them to put the land to rest and prepare for the cold icy blasts from the great bear in the north.

Through the centuries, the four winds have blown warmth, cold, and destruction for the Indians who called the Mohawk Valley home. The events treated here are but a few in the seventeenth century that generated an economic climate to consume him as well as some of his white contemporaries in the desire for transient material things.

Each chapter in this remarkable work stands by itself as a separate, highly informative and engaging essay, often containing rewarding asides. Since the chapters are discrete entities, I will deal with each in turn. Individually, the chapters often appear to stem particularly from Hagerty's earlier addresses and articles. Though resemblances to these latter may be evident at times, additional threads are added to their fabric until they are fresh and new as Hagerty develops each in turn in kaleidoscopic dimensions. Unfortunately Hagerty's prism sometimes turns a little too quickly. The reader may find it disconcerting, for example, in Chapter 1, "Hunters and Havens," to find the pre-Iroquoian culture sequence in the Valley characterized by but a few artifacts, not all of which may be diagnostic. That be as it may, that chapter places the Valley as a whole, and Oak Hill on which Hagerty is to focus, in perspective, as he leads into the evolvement of Mohawk from a Woodland base "... like wisps of Shelley's moving clouds, meeting, blending, and drifting down the sky, some of these later Woodland people came to the valley, drifted and reformed into anew identity," the Mohawks (p. 6). Importantly, too, in that same chapter Hagerty notes that many of the Mohawk sites were reoccupied over the course of time and that some of the sites have been entirely destroyed so that "with few exceptions, one cannot be certain where villages... [named in French, Dutch, or English documents] ... were precisely located" (p. 13).

Chapter 2, "The Trade Fever," introduces the beginnings of Dutch Trade, commencing with Henry Hudson's voyage in the *Half Maen* [Half Moon] up the Hudson in 1609, his entertainment of some Indian dignitaries resulting in "... the first Indian binge to be recorded in New York history" (p. 16). Hagerty's description of the significance of that voyage is singularly fitting:

As new, of the Half Maen got back to Holland telling that furs were to be had for a fist-full of trinkets from the natives along the great river. lip, formed into "Ohs" and heads nodded, and other ships again came to those yellow sands. With them came greedy men of purring eloquence, and along with their beads and axes brought more strong water and without knowing it, disease to trade for commodities [p. 17].

In this same chapter Hagerty traces the emergence of conflict among the Indians for coveted European goods, which had actually begun in the sixteenth century with French (and Basque) trade along the St. Lawrence. Hagerty references Lescarbot's 1606 recording of the destruction of the Algonquins, the Hochelagans, and others living along the St. Lawrence by 8000 (*sic?*) Iroquois (p. 17). Hagerty goes on to show how the Dutch and the French, as opposed to the English got the upper hand in trade with their realization that the great profit to be sought was not whales, fish, or lumber but furs, of which he notes, 10,000 were harvested in New Netherlands in 1628 (p. 23).

In 1634, the Dutch at Fort Orange were perplexed by the trade losses reflected in their ledgers. Chapter 3 details a journey led by the 22-year-old surgeon at the Fort, Harmen Myndertsz van den Bogaert, guided by five Mohawk Indians.

The object of the trip was to learn more about why the Hurons were bringing French goods at discount rates to trade with the Oneida and possibly the Mohawk. Using the measurements in leagues given in the account of this trip, Hagerty attempts to match up a series of archaeological sites with those visited by the party. Regrettably, the value of the van den Bogaert's league is not known. Hagerty notes that at that time, the Europeans indiscriminately used French, German, and Dutch leagues. Furthermore, the measurements for a league varied within different regions of a given country. Finally, most distances were based on estimates. Comparing van den Bogaert's recorded distances between given points with distances given in other accounts, early and modern, as well as with topographic map distances and odometer readings, Hagerty concluded that van den Bogaert's league was about 2.3 English miles (pp. 29-35). He also notably concluded that the first village visited by the party, Onekagoncka, must be 1) one of five known early to mid-seventeenth century sites between Van Wei and Yatesville Creeks (p. 41); 2) that a cemetery related to the village of Cawaage might be located on Sand Hill immediately west of Fort Plain (p. 50); and 3) that prior to its destruction by the NYS Thruway the village of Tenotoge had been located on the south side of the Mohawk River near its juncture with Garoga Creek (p. 61).

Within Chapter 3 a brief account is rendered of the discoveries made under this reviewer's direction in 1961 of the multicomponent cemetery at Sand Hill. Unfortunately, Hagerty's knowledge of what might have been took precedence over what was, viz:

Many of the painful ills that Indians were heir to seemed to have seized them and left their marks on their fragile frames. Despite their exposure to the sunlight in the summer, the lack of vitamin C in the winter put some who had survived infancy into a decline which resulted in ricketts. The marks of scurvy were left on others. A cup full of strawberries daily would have prevented scurvy which caused the loss of teeth, but there were few in the long winter months save those few that had been dried. Exposure and malnutrition brought on tuberculosis, and cancer in lurking tumors eventually prostrated others [p. 52].

This reviewer regrets having to correct Hagerty on these matters, but in the skeletal materials at Sand Hill there was no evidence of rickets, scurvy, tuberculosis, nor of cancer. Hagerty goes on to note "Eroding aneurysms took a toll with the deterioration of arterial walls and produced cardiac problems" (p. 53). While this may have been so, there was absolutely no such evidence in the skeletal remains at Sand Hill.

Hagerty's comparisons of the assumed two-component (but possibly three-component) cemetery regarding mortality rates and assumptions about them also are open to serious question. If the burials are grouped as being seventeenth century when they are not in coffins and eighteenth century when they are, the two populations number 29 and 15 respectively,

a total of 44. The samples are therefore very small. To say that males age 20-30 had a better chance for survival in the early seventeenth century than in the early eighteenth century, as Hagerty does, is certainly misleading. No males are reported in the seventeenth century inventory and two (or possibly three) males are present in the eighteenth century burials. To say that older (31-60 years) males and females had an equal mortality rate in the seventeenth century since two of each were represented in the burials of that period, is similarly misleading. Regrettably, there are additional misunderstandings about the skeletal data which it does not seem necessary to detail here.

Chapter 4, "Van den Bogaert's Return to the Valley," described his flight to escape being brought to justice at the court of Rensselaerwyck. His purported crime was an "exchange of flesh" with a black slave boy of the West India Company. Van den Bogaert was apparently consumed by flames in a Mohawk longhouse that caught fire at some time during or after a possible fracas with a pursuing Dutch officer. Of special interest in this chapter is the ensuing intimidation of the Dutch by the Mohawks who demanded retribution for their loss of a longhouse and the quantity of stored food it contained.

Appropriately entitled, "Onekagoncka and Canagere," Chapter 5 is a discussion of the location of those villages in relation to the so-called Jeronimus Delacroix map of 1634. This is the first known map of the Valley. Hagerty skillfully argues that the map is one made from memory and faulty at best, a view supported by the research of Gehring and Starna (1985) who make it abundantly clear that the map is fraudulent. Relying upon a variety of datable artifacts from two sites as well as the fact that distance between these sites match the distance given by van den Bogaert when he visited them in 1634, Hagerty tries to identify the villages of Onekagoncka and Canagere. He assigns the Bauder Site as Onekagoncka and a site which he does not identify by name as Canagere. Hagerty also suggests that the twice-occupied late seventeenth and early eighteenth century Allen Site might be a candidate for van den Bogaert's Schandisse (p. 90). Hagerty argues that the Printup Site could not be Delacroix's site of Icanderago since too many post-1626 artifacts are found there. This last argument seems to be inconsistent with Hagerty's multiple occupation observations noted elsewhere. In sum, it appears to the reviewer that much more data need be forthcoming before most historic site designations be assigned in the Valley.

The two chapters which follow, Chapter 6, "The Beaver," and Chapter 7, "Want and Wampum," were presented together, as the reviewer recalls, several years ago at a New York State Archaeological Association meeting where Hagerty markedly ran over his time to the delight of his audience. Hagerty's Chapter 6 is a superb account based upon a wide variety of excellent sources including Lescarbot, Innis, Sir William Johnson, Witthoft, Jameson, and van Laer. The chapter researches the animal's habits, the ways it was captured, the types of pelts, and their processing depending upon their destined use, markets and their monetary value. Hagerty notes,

---Changing fashions made the beaver flutter like the stock market. In 1700 such an unstable market in England left the fur merchants holding a surplus of fur. We think of today as an age of specialization, but constellations of seventeenth century merchants in the trade expected different grades and qualities of beaver pelts to special markets in different countries. England took white fur, for instance, when white hats were in vogue there, and Holland sent the backs to Russia ...[p. 100] [where the downy undercoat served to make hats and the covering for boxes, trunks and slippers and thin strips were used as sieves [p. 97].

A more convenient medium of exchange than beaver pelts was soon seen to be necessary in New Netherlands. The new currency was to be wampum. Hagerty devotes Chapter 7 to its origin, its manufacture, and its uses and abuses. The chapter is insightful and powerful. He traces the first use of wampum by the Indians to 2000 years ago and explains its uses as a currency, a mnemonic device, and as credentials for Indian "ambassadors." Hagerty calculates the number of beads which made up the standard measure of wampum, the "hand," being 48 beads, a length of c. 10 inches worth 10 stuivers (at 20 to a guilder) and the "fathom" being 320 beads, a length of c. 6.6 feet worth 4 guilders (80 stuivers). Hagerty goes on to show how the poor quality of Dutch-manufactured wampum together with a progressive decline in the beaver population, smuggling, a network of internal corruption as well as competition with the English, the French, and the Swedes led to inflation. The value of wampum had decreased by 50% by 1660 and the demise of the colony was imminent.

In Chapter 8, Hagerty deals with "Guns and Guilders." This carefully researched piece traces the earliest probable sources of guns among the Mohawk to the English and French. Despite the Dutch Ordinance of 1639 forbidding the supply of firearms or munitions to the Indians under pain of death, the Mohawks managed to receive guns illicitly, when, rather than death, seven fines were levied upon the trader miscreants. On the other hand, they might receive guns legally from the Patroon for "self defense in time of need," or because of threat of war against the settlers. Hagerty nicely documents these events and in this chapter and in Chapter 9, "The Haves and the Havenots," he recites the consequences of the Mohawk becoming armed and he traces the evolution of the gun in the Northeast, shows its presence on archaeological sites, and recounts the destruction of the Mohawks' enemies, including the entire Huron Confederacy and the Susquehannocks, as the League of the Iroquois expanded its dominion from the Atlantic to the Mississippi and from the Ottawa River to Tennessee.

Chapter 10, "In the Spider's Web," the longest chapter in the book, is the most masterful and eloquent. It is also gripping and terrifying. It is the story of the Reverend Father Isaac Jogues among the Mohawk based on the Alegambe manuscript and Father Lalemant's letters to his superior as published in the

Jesuit Relations and Allied Documents. It is written as a short story filled with pathos and complete with befitting dialogue. The opening scene takes place in mid-June 1642 at the Jesuit Mission of Sainte Marie with the Mission's founder and four-year veteran of the wilderness, Father Jogues, and a party of 18 Hurons and Algonquins and 5 Frenchmen, together with what beaver pelts could be stored in 4 canoes, setting off for Quebec to secure needed supplies for the forthcoming winter. On August 2, the first day of the return trip which had of 40 men in 12 canoes, 4 Frenchmen and 36 Hurons and Algonquins. The Frenchmen included two *donnes*, laymen who have dedicated their lives to the service of the Church in return for their keep. These were Guillaume Couture and Rene Gopil, Jogues' most dedicated disciples. The party was ambushed and the tale of hideous torture and death is as excruciating as might be imagined. Jogues himself, following a year of brutal captivity, finally escapes under the auspices of Arent van Curler, the Patroon's Director of Rensselaerwyck, who had been trying repeatedly to pay for Jogues' release. Hagerty recounts how van Curler personally concealed Jogues in his house and had him shipped to Manhattan. After a host of misadventures, he finally arrived at his College at Rennes on Christmas morning, 1643.

Hagerty goes on to graphically describe how Jogues returned, at the request of the Governor of New France, to visit the Mohawk as a political ambassador of peace in 1646 only to be murdered and to have his decapitated head stuck on a palisade pole at the Village of Oneugioure. This story, replete with matchless courage, is a stirring tribute to the Jesuit Order. It also makes abundantly clear why the Iroquois were in dread of the Jesuit's "magic" which they firmly believed could cause pestilence and death among their people. Hagerty takes up this issue in explaining the murder of Gopil, the fear of the sign of the cross and of the strange garments and appurtenances of the Jesuits, and in the need for the Mohawk to appease their divine power, Ariskoi, through whom they received their strength and success in the hunt and whose spirit must be appeased by eating the flesh of their enemies.

In a brief statement Hagerty brings insightful testimony to this period of proselytization:

It was a savage and relentlessly cruel world as the forces of nature went a savage and cruel world as the men in it went. For out of Europe came men who had been conditioned by a philosophy taught from the harsh lessons of survival in the greedy and conniving courts of Europe where these were serpents in men's smiles. They too had a purpose - that of exploitation, and they were not averse to using the cross to further the purposes of the sword and harquebus [p. 146].

In Chapter 11, "Oak Hill - Tionontoguen," Hagerty presents a compelling argument that Oak Hill was the third village to which the hapless Jogues and his companions were taken for their fourth round of torture since their capture. The

argument is based on archaeological evidence and includes glass trade beads, Dutch clay pipes, and a decoration (prunt) from a German goblet, all of which date to the time period in question of c. 1630-1650. Furthermore, three silver Dutch coins, two bearing the dates of 1618 and the other 1623 or 1625, were recovered from the site. Hagerty, on the basis of his own examination of coins, found that they have a circulation rate of about 20 to 25 years. Then, of considerable significance was Hagerty's personal discovery of a one-inch long silver reliquary Jesuit cross containing what appeared to be a wafer of wax, later identified as probably an *Agnus Dei* [Lamb of God] piece of beeswax, blessed by the Pope on Purification Day and then distributed to the people. Included on the cross is the symbol of the Jesuit Order, IHS. The cross has eyes at each end which, though worn, appear to have been torn apart, as though wrenched from their chain of suspension. A tiny silver ring, part of the chain which apparently held this cross was in one eye of the cross and a bone or ivory bead lay close by. The cross has been authoritatively identified as a personal artifact. In addition, collectors led by Harry Schoff in the 1930s excavated five pits along one side of the site. From them were recovered three items of Christian significance. They were a pewter oil container cap relating to Extreme Unction, the Last Sacrament; a probable piece of silver paten, a receptacle for the sacred wafers of Eucharist (Holy Communion) of similar size and thickness to those found at Sainte Marie among the Hurons; and lastly, the cup portion of a silver chalice whose interior is gold-leafed, but whose base is broken away.

Also interesting, though the oil container cup and the possible paten were each found with the remains of a burial, the chalice was not. Schoff said, "I found an iron axe about two feet down and about 12 inches further. I found the cup but I could find no trace of the skeleton which seemed very strange" (p. 209). Hagerty interpreted the find as ceremonial "killing" of the spirit of the cup so it could wreak no sorcery upon the Indians. He also pointed out that Jogues had written that in the packages destined for Sainte Marie, when the party was attacked, there were "church vessels" (p. 213).

Since this is the westernmost Mohawk Village of the 1630-1650 time period, it would seem on the basis of Hagerty's well reasoned argument that the site is indeed that of Tionontoguen. Rumrill's analysis of materials also causes him to identify this site, which he calls Oak Hill No. 1, with Jogues' Tionontoguen (Rumrill 1985:16-17).

In Chapter 12, "Ossernenon, Andagaron, and Andaraque," Hagerty attempts to correlate additional archaeological sites with the historical record. Ossernenon and Andagaron were the two other villages named by Father Jogues when he was their captive in 1642. Andaraque was the first of five Mohawk villages to be destroyed by the French forces led by de Tracy in 1666. Ossernenon was the easternmost village of the Mohawks when Father Jogues and his party were captured in 1645, and it was the first village they

were to enter and provide "entertainment" for its occupants. Hagerty notes that "when Jogues returned to the Mohawk in 1646, he said that they arrived at the first small village called Oneugioure formerly Ossernenon" (pp. 240-241). Using this information, Hagerty makes note of the distance to Tionontoguen from Fort Orange given by van Curler in his attempt to rescue Jogues and his fellow Frenchmen. Hagerty also notes that Jogues' estimate of the distance between these same points in 1646 closely matched that of van Curler. Assuming that Jogues' league was consistent at c. 3 miles to the league, Hagerty cogently argues that the site where Jogues met his death was in the vicinity of Caughnawaga Rapids on the Mohawk River. He then goes on to argue on the basis of apparent topographic conformity to Jogues' 1642 account, together with artifactual conformity to the time period, that the Printup Site must be the site in question.

Hagerty's position on the topographic conformity rests heavily on the premise that from the villagers' vantage point on a high hill, they could see their war party of 1652 returning home. They therefore were able to quickly provide an appropriate "reception" for the victims. To this reviewer, the call for an observational vantage point seems unnecessary since advance scouts would unquestionably give notice of the pending arrival of a returning war party. The Printup Site would fit the 1640s time period and may indeed be either the site where Jogues was taken in 1642 *or* in 1646. However, since the westernmost Mohawk village bore a different name in 1642 from that given to it in 1646, it may not be the same site. This entire matter may take years to resolve. Rumrill considers the Bauder Site to be both Ossernenon and Oneugioure (Rumrill 1985:17). Interestingly, Hagerty does not discuss the finds at the present site of the Auriesville shrine, long thought to be the place where Jogues was martyred.

Hagerty's identification of the site of Andagaron, the second site to which Jogues was taken in 1642, rests on even more tenuous grounds. Jogues said it was "two miles" to the west "of Ossernenon." Up to this juncture, Hagerty has considered Jogues' estimates of distance to be correct. Now, however, Hagerty argues Jogues may have used "mile" when he meant "league." "When he wrote this, his mind was far from being in a philosophical calm. He was beset by myriad problems. His mind was on escape from the Mohawk and his body was in pain" (p. 254). Hagerty goes on to note that the nearest archaeological site of the time period would be "at least 3 miles up the valley from Yatesville Creek" (p. 254). Hagerty does not discuss this site but argues that the Mitchell Site *two leagues* distant is large and would fit the time period. This reviewer must note that while the Mitchell Site fits the time period on the basis of the artifacts recovered from it, there are some problems with identifying this site with the site of Andagaron that cannot be overlooked. Paramount among those is the question of whether Jogues really meant to say "2 leagues" when he actually said "2 miles," and the other is, where is the site Jogues mentioned, but didn't name in his 1642 account which lay *between* Ossernenon and Tionontoguen (cf. p. 240)? Is the Mitchell Site that "Site X?" It is somewhat surprising that Hagerty did not focus on the

latter question. In any event, since Hagerty's death in 1984, a new site has been found by Donald Rumrill, and its latest component fits the 1630-1650 time slot (Rumrill 1985:13-15, 17). Might it be Andagaron or Site X?

Now, of Andaraque, one of five Mohawk villages destroyed in the de Tracy invasion of 1666, Hagerty's account is potent, viz.: "[a] light October breeze carried the odor of their burning flesh" (p. 261), referring to Indian victims of the Mohawk discovered in the village "tied to a post hanging limply over a slow fire still glowing under them" (p. 261) and where de Tracy's commander of the Artillery on October 17 of that year, gave

... proclamation taking possession of the said fort and of all the lands in the neighborhood ... and of the other 4 forts which have been conquered ... and in token thereof have planted a cross before the doors of said fort and near this hath erected a post and to these hath affixed the King's arms and caused the cry of *vive le roy* to be repeated 3 times. Done at the aforesaid fort of Andaraque the day and year above written [p. 261].

Hagerty further notes that "The French report said, 'Our troops found the villages abandoned and the barbarians were only seen on the mountains (hills) at a distance uttering great cries and firing some random shots at our soldiers' " (p. 262). Hagerty interprets this statement to mean that the Mohawks were firing from the hills near Andaraque. However, as can be seen, this report did not specify which of the five sites destroyed by de Tracy's troops might be involved.

The Freeman Site has high hills nearby. That site's artifacts do relate to the time period in question. It was of short duration, dating in the 1660s. Furthermore, it has revealed charred posts (p. 262). Rumrill agrees that this must be the site of Andaraque noting that a section of a bastion has also been discovered there (Rumrill 1985:25-27). It seems to this reviewer that on the basis of the evidence presently available, the site can only be identified as one of the villages destroyed by de Tracy. It may not be Andaraque.

After discussing the problem of historic identification of several additional sites Hagerty concludes "In one's enthusiasm to date a site, he is apt to forget that he doesn't have all the evidence. He never will ... one never knows what will turn up in the site tomorrow, and he must be ready to adapt to this change ..." (p. 272).

Hagerty's Chapter 13, "Oak Hill Revisited," is nostalgic as might be expected, but it has a surprising touch, a novel twist, to which we are introduced as if by the plaintive strains of an oboe.

"On some foul night when wolves howled and owls screamed, the windows crackled and spilled out in a cascade of glass splinters while the flaming structure crashed to the ground enveloping all the possessions that made up the simple household" (p. 276).

Hagerty tells of his discovery of the remains of a little house that had no chimney and asks "what white man would have no provision for a chimney?" (p. 278). Hagerty eruditely discusses his finds, relentlessly pursuing the historical significance of such things as "R over Tippet" on a pipe bowl and "three plain flat brass buttons [which] had wire loops anchored on the back," assorted ceramics, and three British George II "ha' pennies" dating to 1738 and 1755. Turning to the historic literature, Hagerty discovers that Sir William Johnson mentions an "Isaac of the Hill" and an "Aaron of the Hill." Perhaps, Isaac or Aaron had been the owners of the house, or perhaps it had belonged to one of the other 19 Mohawks who had left their castle of Canajoharie over a dispute with their chiefs. These would be the last to leave their valley. Their homeland was now the property of the white man.

Hagerty has covered a wide range of topics in this remarkable book. Would that he had been alive to proofread it or that someone knowledgeable had done so. The book is simply so replete with "typos" that it would be tedious to list them. Unfortunately, they do include personal names. For example, Director General of the Dutch West India Company Stuyvesant's name appears seven times throughout the text. It is given as Stuyvesant (p. 29), Stuyvesant (pp. 70, 103, 126, 129), Stuyvesant (p. 110) and finally Stuyvesant (p. 229). Furthermore, the name of Jogues' *donne*, Guillaume Couture, is misspelled in the Index as Gillaume which is how it also appears on p. 148. It then appears as Guillume (pp. 159, 260). It is correctly spelled once (p. 149). Some of the "typos" are comical as in "... the Mohawks looked at him [Jogues] with lips agape, like the shell of a *muscle* ..." (italics mine.)

The work is referenced throughout in the left margin of each page with a number to indicate each reference. This is followed by another number or numbers to indicate the page number(s) in each reference. Upon turning to the Index, the reader is told under the References, "Reference numbers cited are the same in most of Mr. Hagerty's Publications: those not identified here are [sic omit are] were not used in this volume" (p. 285). Unfortunately, one does not find all the references cited given under the "Bibliography." Missing numbers in the consecutive series are to be found under "Correspondence and Interviews," under "Collections Studied," or under "Other Identities." Had the author and date of each work as well as the page(s) been cited throughout the text (e.g., Ritchie 1944:25-27) and if the references were then given alphabetically under the references section, the work would have been easier for the reader to use.

Another sad note is that the photographic illustrations, like that of the site Hagerty dwells so much on, Oak Hill, depict little more than blobs. They are black and white positives directly printed, apparently from 2 in x 2 in color slides, a process which gives very contrasty prints and could have easily been corrected had the printers been aware of the process. Items are also sometimes shown upside down

as in the case of the human effigy on a pot (p. 234) and the pottery vessel rim sherds (p. 266). Items illustrated are rarely identified by a caption. Instead, they are illustrated close to the text concerning them. They may then be in the margin (e.g., the three on p. 276), on the top of the page (e.g., the two on p. 277), or between paragraphs (e.g., the one shown on p. 277). This technique is an interesting one and usually effective. Sometimes, however, the reviewer wondered if the reader would always be able to recognize what the items being shown actually represented. Personally, I could not. For example, the third item down in the margin of p. 81, the lower item shown on p. 84, and the variety of items shown on pp. 133 and 134 are puzzlers. One wishes, too, that Hagerty had used a classification system to cover the many bead types he describes in various parts of the text. His bead descriptions for the most part simply do not give the reader a very good idea of what he is talking about. What a shame, then, that this fine study should be wanting on such matters. Several of us did offer to assist in an editorial way while the work languished at the printer's for several years.

As noted at the outset by this reviewer, the astonishingly wide range of topics covered by Hagerty's treatises seemed to call for review chapter by chapter. In perspective, one is impressed by the demonstrably keen mind of a tireless researcher who has added much to our knowledge of Mohawk Valley history and archaeology. While all of Hagerty's conclusions as to archaeological site identifications with important historic sites may not stand the test of time, his cogent arguments, pro and con, will surely help to ascertain the true identity of the sites in question. Hagerty's scholarly discourses on subjects ranging from the beaver, wampum, and a variety of trade goods are lasting treasures that will prove of value to researchers and lay readers alike as they continue to appreciate their depth, their substance and their resource value. Hagerty's prose and poetry shine like his "Little Falls Diamonds." He is truly refreshing and completely captivating as he writes of the vicissitudes of van den Bogaert and Father Jogues. This is altogether a fascinating book for the discerning reader wanting to explore some of the multifaceted labyrinths of man's adventures in the Mohawk Valley through 10,000 years.

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