

THE BULLETIN

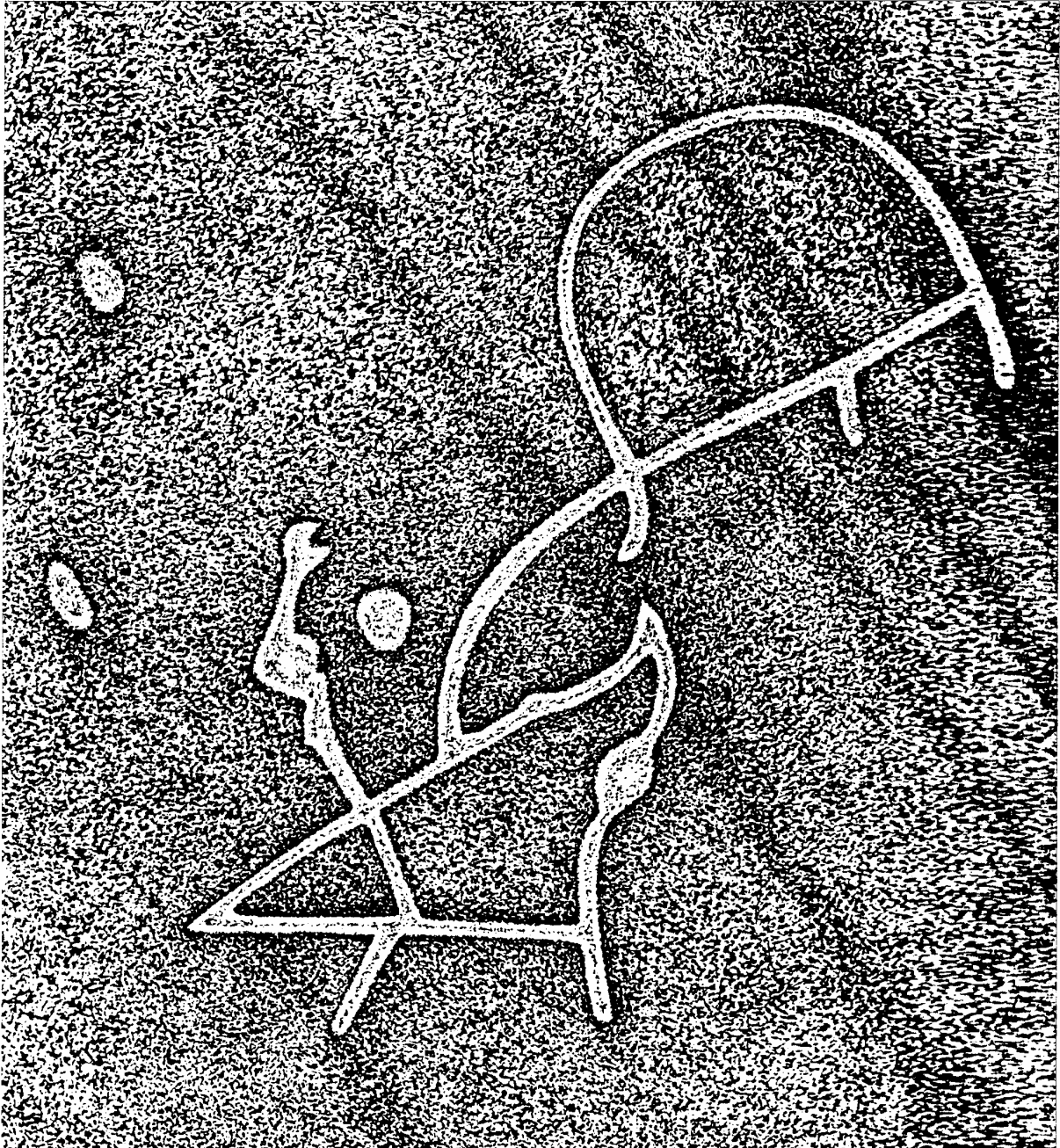
Number 105 Spring 1993

Contents

<i>An Indian Petroglyph on the Hemlock Hill Trail</i> Edward J. Lenik, Thoman Fitzpatrick, and Nancy L. Gibbs	1
<i>A Twentieth-Century Petroglyph on Horse Pound Brook</i> Edward J. Lenik, Thoman Fitzpatrick, and Nancy L. Gibbs	3
<i>Aboriginal Petroglyphs at Greene Point, New York</i> Michael F. Laccetti	6
<i>Late Pleistocene and Holocene Vertebrates from Joralemon's (Fish Club) Cave, Albany County, New York</i> David W. Steadman, Lyda J. Craig, and Thomas Engel	9
<i>The Lenape and Other "Delewarean" Peoples at the Time of European Contact: Population Estimates Derived from Archaeological and Historical Sources</i> Marshall, Joseph Becker	16
<i>The Functions of Thermally Altered Stones: A Preliminary Study</i> Peter Pagoulatos	26
<i>Niagaraware: A Unique Indian Material Culture and Culture Region</i> Jeffrey J. Gordon	30
<i>Book Review: The Massawomeck: Raiders and Traders into the Chesapeake Bay in the Seventeenth Century</i> by James F. Pendergast William E. Engelbrecht	35
Comment Donald A. Rumrill	36
1992 Annual Meeting Minutes	38
1992 Annual Meeting Program	40

The Bulletin

Journal of the New York State Archaeological Association



Hemlock Hill Trail Petroglyph

The New York State Archaeological Association

Officers

Robert J. Gorall President
Albert D. LaFrance Vice President
Muriel E. Gorall Secretary
Carolyn O. Weatherwax Treasurer
Karen S. Hartgen ESAF Representative

Publications

Researches and Transactions • The Bulletin • Occasional Papers

Publications Chairman

William E. Engelbrecht
Dept. of Anthropology, Buffalo State College
1300 Elmwood Avenue Buffalo, New York 14222

The Bulletin

Editor Charles F. Hayes III
Assistant Editors Connie C. Bodner, Brian L. Nagel
Graphic Design and Composition Patricia L. Miller/PM Design

Address c/o
Research Division
Rochester Museum & Science Center
657 East Avenue, Box 1480
Rochester, New York 14603-1480

The views expressed in this volume are those of the authors and do not necessarily reflect the position of the publisher.

Published by the New York State Archaeological Association. Subscription by membership in NYSAA.

For membership information write:

Muriel E. Gorall, 2290 Tyler Road, Newark, New York 14513

Back numbers may be obtained from

The Research Division, Rochester Museum & Science Center,
657 East Avenue, Box 1480, Rochester New York 14603-1480

Entire articles or excerpts may be reprinted upon notification to the Editor. All manuscripts submitted are subject to editorial correction or excision where such correction or excision does not alter substance or intent.

ISSN - 1046 -2368

Printed by Monroe Reprographics, Rochester, New York.

Copyright © 1993 by the New York State Archaeological Association

An Indian Petroglyph on the Hemlock Hill Trail

Edward J. Lenik, Thomas Fitzpatrick, and Nancy L. Gibbs, Incorporated Orange County Chapter, NYSAA

A petroglyph consisting of two zoomorphic figures, a turtle and a deer or elk, carved on the surface of a bedrock outcrop is described. Located on a hiking trail within Harriman State Park, these designs may represent some element of hunting activity in the region by Native American bands during the Late Woodland Period.

It was Saturday December 1, 1990; the sky was clear and the temperature cool and crisp. The morning sun flashed brilliantly from the southeast as we hiked along the rugged Hemlock Hill Trail in Harriman State Park. We approached an outcrop of bedrock. The slanting rays of the winter sun revealed to our startled eyes two incised designs in the crest of the ledge. The moment and timing of this petroglyph discovery were perfect; we were in the right place at the right time under the best of weather conditions. Undoubtedly, thousands of hikers have literally walked over this site totally unaware of this significant cultural artifact at their feet. The Hemlock Hill Trail petroglyph is located in the Town of Tuxedo, Orange County, New York (Figure 1). The petroglyph is carved on the top surface of a bedrock outcrop situated on a hiking trail to the south of Tom Jones Mountain. The trail is well established and was once a mountain road. In fact, a trail or unimproved road is indicated in this location on a map of the region as early as 1851 (Sidney 1851). The petroglyph site lies in a hollow between two ridges. A freshwater spring emerges from the base of the ridge about 200 ft west of the site and forms a stream as it flows downslope in a southeasterly direction. A marsh is located some 100 ft to the east of the site and extends to the south-southeast as well. The bedrock of the region is granitoid gneiss.

The petroglyph consists of two incised and contiguous designs carved into the top surface of the granite ledge (Figure 2). The easternmost design, shown in Figure 2, appears to represent a deer or elk in profile or side view. Its somewhat triangular body has well-shaped antlers protruding from the head, which faces south, and a clear upturned tail. Immediately below the tail is a circular shallow depression 15 mm across that we interpret as an orifice. Two appendages, presumably legs, extend from the body of the figure. The design to the right appears to be that of a turtle, also portrayed in side view. The head of the turtle, which also faces south, touches the body of the deer or elk. The dome-shaped carapace is readily apparent, and three appendages extend from the body.

The incised designs are shallow, about 2-3 mm in width and 17 cm in overall length. The figures are patinated and have an appearance of great antiquity. We believe that the Hemlock Hill Trail

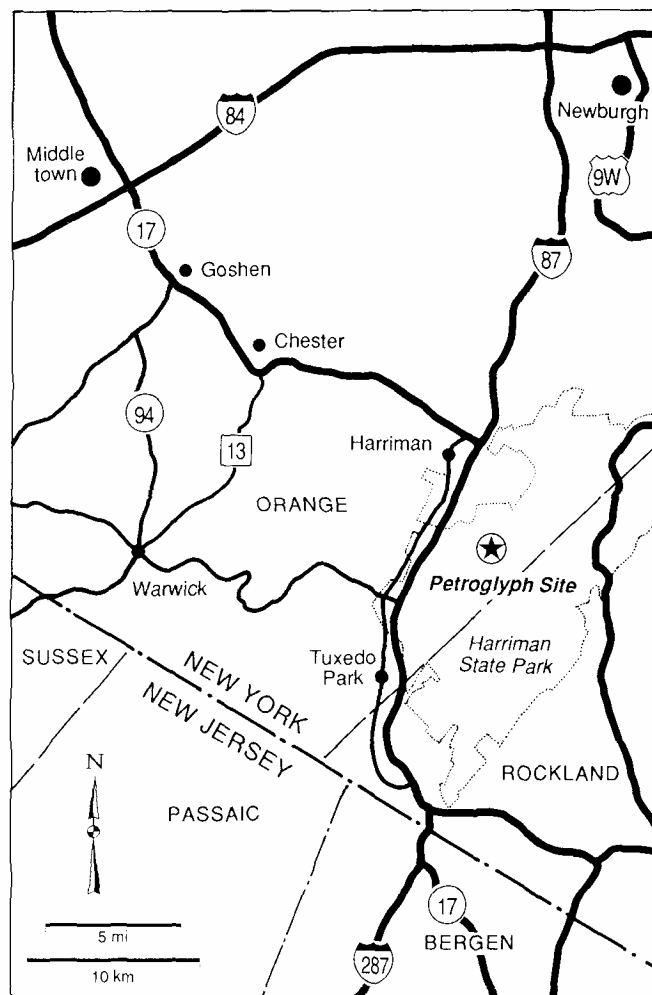


Figure 1. Generalized map of southeastern Orange County, New York, showing location of Hemlock Hill Trail Petroglyph.

Petroglyph is a Native American rock carving that is probably of Late Woodland age. Although its meaning and purpose are not known, we nevertheless interpret its presence as follows.

The turtle figure may represent the turtle clan of the Munsee-speaking Delaware Indians who once roamed through this area prior to the coming of the Europeans (Goddard 1978a, b). From ethnohistoric accounts, we know that the turtle or tortoise is prominent in the creation myth of the Delaware Indians (Newcomb 1956:72). According to this creation myth, the first

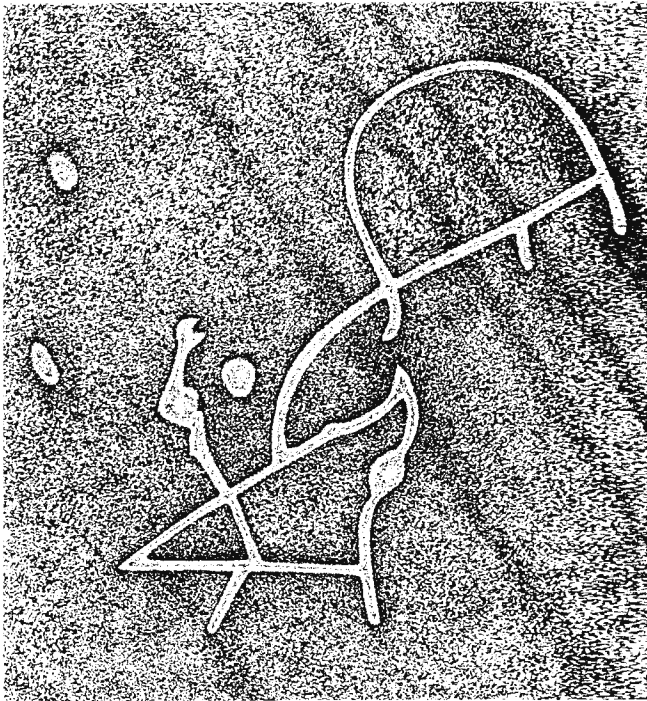


Figure 2. Detail drawing of Hemlock Hill Trail Petroglyph by Thomas Fitzpatrick. Overall length 17 cm.

humans and thus life itself sprang from a tree which grew on the back of a turtle which was itself surrounded by water. The fact that the turtle touches the deer-elk in the petroglyph suggests that some form of sympathetic hunting magic may have been intended at this site.

We believe that the turtle and deer-elk designs may represent a spiritual attempt by the Indians to procure success in hunting in the area. The petroglyph may also represent a trail marker or designate a hunting territory of the Delaware Indians. The site's location along an old trail and in an area of known Indian occupation and use lends weight to these interpretations. A similar turtle petroglyph was found on a glacially deposited boulder which was located on a trail that parallels the Bronx River within the grounds of the New York Botanical Garden, the Bronx, New York (Lenik 1988:17-20).

Several Indian campsites have been found in the vicinity of the Hemlock Hill Trail Petroglyph Site (Hartgen 1989:59). One site is located to the northeast at Little Long Pond, and a second is southeast at Lake Sebago. A third site, a rock shelter, is located near Lake Skenonto. Unfortunately, the cultural affiliations of these

sites are not known. A fourth reported site is located in a hollow west of the petroglyph and is attributed to the Late Archaic Period. Our own reconnaissance in the vicinity of the petroglyph find revealed the presence of five nearby rock shelters which could have been utilized by Indians as temporary habitation sites while on hunting and gathering forays through the area.

In summary, the Hemlock Hill Trail Petroglyph is a Native American work of art that probably dates to the Late Woodland Period, c. A.D. 1000 to 1600. The designs consisting of two zoomorphic figures, a turtle and a deer or elk, may represent some element of hunting activity in the region by the Delaware Indian people. This rare and unique find adds much to our knowledge of Indian life in the highlands region of southeastern New York.

References Cited

Goddard, Ives

1978a Eastern Algonquian Languages. In *Handbook of North American Indians*, Vol. 15, pp. 70-77. Bruce G. Trigger, volume editor. Smithsonian Institution, Washington, D.C.

1978b Delaware. In *Handbook of North American Indians*, Vol. 15, pp. 213-239. Bruce G. Trigger, volume editor. Smithsonian Institution, Washington, D.C.

Hartgen Archaeological Associates, Inc.

1989 *Cultural Resources Overview for- Orange County, New York Stage 1 A Literature Review*. Troy, New York.

Lenik, Edward J.

1988 A Turtle Petroglyph on the Bronx River. *The Bulletin*, Journal of the New York State Archaeological Association 97:17-20.

Newcomb, William W. Jr.

1956 *The Culture and Acculturation of the Delaware Indians*. Museum of Anthropology, University of Michigan Anthropological Papers 10. Ann Arbor, Michigan.

Sidney, J.C.

1851 *Map of Orange County, New York*. Published by Newell S. Brown, Newburgh, New York.

A Twentieth-Century Petroglyph on Horse Pound Brook

Edward J. Lenik, Thomas Fitzpatrick, and Nancy L. Gibbs, Incorporated Orange County, Chapter, NYSAA

Hawk Rock, located on Horse Pound Brook in the Town of Kent, Putnam County, New York, is described and illustrated. A tall glacial boulder, it contains three carved designs, interpreted as a turtle, a beaver, and a bird. The Hawk Rock Site, long known to local residents, has been a source of speculation regarding its origin for many years. Documentary and oral history research and field analysis have determined that this petroglyph was carved in the late 1920s by local residents.

Hawk Rock is a 25-ft high glacial boulder found in the Town of Kent, Putnam County, New York, on the west side of Horse Pound Brook south of Whangtown Road (Figure 1). The local name of this prominent feature is appropriate; its likeness to a perched hawk is immediately apparent (Figure 2). This name may be twentieth century in origin. It does not appear on an 1867 map of Kent by F. W. Beers on which another rock, "Horse Pound Hill & Rock," is noted (Beers 1867).

Three designs are carved into the vertical north face of Hawk Rock. They are interpreted as a turtle, a beaver, and a bird (Figure 3). The turtle carving is 12 in (31 cm) in length from head to tail, and its body is 5.75 in (15 cm) in width. The bird is 12 in (31 cm) in length from its beak to its tail. The figure of the beaver is 6 in (15 cm) in length and 3.2 in (8 cm) in width. A scale drawing of the designs is shown in Figure 4.

Edward J. Lenik and Thomas Fitzpatrick examined this petroglyph in 1987 as part of a cultural resource survey of the Fieldbrook Subdivision property on which it is located (Lenik and Crichton 1988). The carvings appear to have been cut with metal tools. The turtle is the most prominent symbol, and circular punch marks are visible in the grooves that form its shape or outline. There are also six punch marks placed in a straight line on the back of the turtle. A few punch marks are visible in the grooved outline of the bird and beaver as well. In general, the grooves are 3 mm to 4 mm in width and 2 mm to 4 mm in depth. The turtle and the bird were cut into the hard granite surface with some care while the beaver is somewhat cruder and less distinct.

Oral accounts recorded local knowledge of these carvings in the 1940s when Myron Thompkins of Horse Pound Road recalled seeing the designs. Nick Shoumatoff, then curator of the Trailside Museum, Ward Pound Ridge Reservation, Cross River, New York, photographed and recorded the site in 1971. He referred to the petroglyph as the "Needle" petroglyph and indicated that the area had been a Boy Scout camp. He concluded that these carvings were twentieth century in origin and not associ-

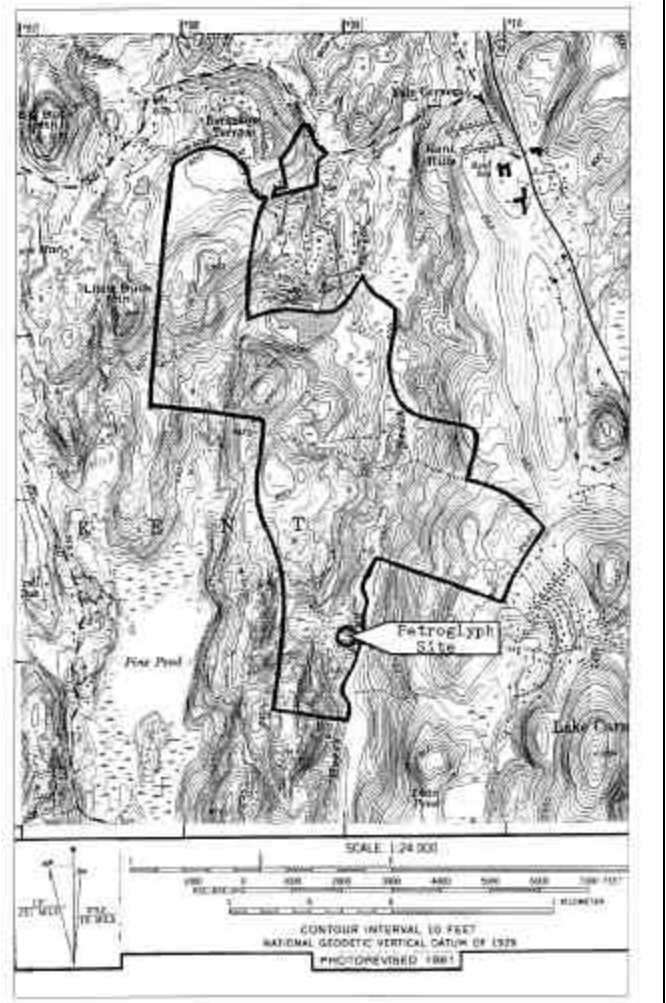


Figure 1 Portion of U.S.G.S. map showing location of Hawk Rock Petroglyph.

ated with the evidence of Indian occupation recovered in a rock shelter just north of Hawk Rock (Shoumatoff 1971).

In 1987, Lenik and Fitzpatrick concurred with Shoumatoff's conclusion. Physical evidence argued against antiquity; the designs appeared to have been cut or recut with metal tools, and there was a lack of weathering and patination to the designs. Land-use history indicated modern activity; the use of the area by Boy Scouts, an organization given to recreating Indian activities, adequately explained the presence of the designs.



Figure 2. Hawk Rock. View of north side. Arrow points to location of Petroglyph. (E. J. Lenik, photographer, 1987.)

In 1988, Edward J. Lenik, working with the New York City Landmarks Preservation Commission, discovered a prehistoric turtle petroglyph carved on a glacial boulder found on the banks of the Bronx River within the grounds of the New York Botanical Garden (Lenik 1988). This find was well publicized by the Botanical Garden, and Carol Reich, formerly of Kent, contacted Mr. Lenik about the Hawk Rock Petroglyph (Reich 1988). Her grandfather, General Leonard Smith, bought the adjoining property in 1906, and she recalled seeing the carvings at least as early as the 1930s. This new information and a similarity in design between the Bronx turtle and the one on Hawk Rock prompted our renewed interest in the origins of the Hawk Rock Petroglyph.

In 1989, Edward J. Lenik and Nancy L. Gibbs visited the Putnam County Hall of Records to read property deeds that might reference Hawk Rock and its designs. Horse Pound Brook, just east of Hawk Rock, was a property boundary from colonial days; its demarcation could have involved carving of the designs. We found no mention of the rock and the carvings in the appropriate deeds.

We next contacted Putnam County Historian Sallie Sypher at her offices in Mahopac Falls. She had no more knowledge of the site other than our 1987 report, but she graciously referred us to two people



Figure 3. Hawk Rock Petroglyph. (E. J. Lenik, photographer, 1987.)

who were able to settle the question of the petroglyph's origin once and for all (Sypher, personal communication 1990). Dick Muscarella, Kent Town Historian, wrote to us to say that he knew some old gentlemen, brothers, who reside on Horse Pound Road and have in their possession a photograph that shows a cabin about 50 yd from Hawk Rock (Muscarella, personal communication 1990). They tell a story that a pine tree fell against the rock and that as young men they climbed the tree and carved their initials on the rock. They were silent when questioned about the animal carvings, but a friend of theirs claims to have carved these.

More details came to light in a letter from Betty M. Light Behr, also of Horse Pound Road (Behr, personal communication 1990). Mrs. Light Behr was born and raised near the site. Her father, Frank B. Light, also native to the area, was a naturalist and photographer, and Mrs. Light Behr hiked the region with him. One of the early families in Kent is the Hunt family, who are related to Mrs. Light Behr. Three Hunt brothers, all in their 70s and 80s, Leroy, Harry, and Gilmore, still live on Horse Pound Road. Mr. and Mrs. Harry Hunt were invited to reminisce at a meeting of the Kent Historical Society in 1988, The Bronx

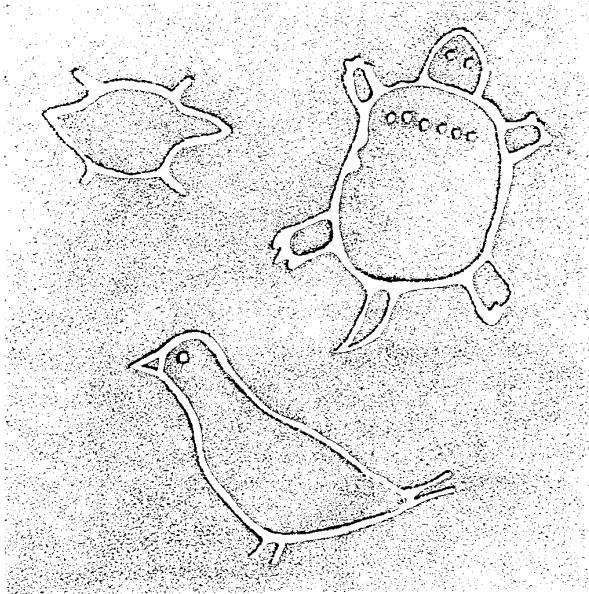


Figure 4. Detail drawing of Hawk Rock Petroglyph. (Drawing by T. Fitzpatrick.) Length of bird 31 cm.

petroglyph was in the news then, and Harry Hunt was asked what he knew about the Hawk Rock Petroglyph. He related that he and his brothers and some school pals made the drawings. This would place the origins of the designs in the late 1920s.

Mrs. Light Behr also recalled that from 1940 to 1966 Colonel Smith permitted use of his land near Hawk Rock by the Order of the Arrow, the most highly ranked Boy Scouts, and those most deeply into ceremonial Indian-like behavior. The designs may have taken on their reputation of Indian origin at this time. The post World War I youth movements from which the Boy Scouts grew in the United States drew much inspiration from a romanticized view of the American Indians. Camping and crafts and outdoor activities were based on Indian lore in which the native people of the North American continent were accorded a respect and admiration lacking in the nineteenth century. The *Book of Woodcraft* by Ernest Thompson Seton (1921), chief of the Woodcraft Indians, has pages of Indian signs and designs for the use of young campers. Twentieth-century children play Indian in the woods, reliving the tales and crafts of the noble savage and sometimes leaving artifacts such as the Hawk Rock Petroglyph, which are almost taken for the real thing. We publish this report knowing that as years go by the Hawk Rock Petroglyph will weather and develop the patina of age it now lacks. Against that day when it is newly discovered again and taken as the real thing, we document the story of its origin noting that it is a twentieth-century tale that has its own charm.

References Cited

- Beers, F. W.
1867 Map of the Town of Kent. *Atlas of New York and Vicinity*. Beers, Ellis, and Soule, New York.
- Lenik, Edward J.
1988 A Turtle Petroglyph on the Bronx River. *The Bulletin*, Journal of the New York State Archaeological Association 97:17-20.
- Lenik, Edward J. and Deborah J. Crichton
1988 *Cultural Resources Reconnaissance Survey of the Fieldbrook Subdivision Property, Town of Kent, Putnam County, New York*. Sheffield Archaeological Consultants, Wayne, New Jersey.
- Seton, Ernest Thompson
1921 *The Book of Woodcraft*. Garden City Publishing Co., Inc., Garden City, New York.
- Shoumatoff, Nicholas
1971 Balgooyen Needle Petroglyph Field Notes. On file, Delaware Indian Resource Center, Trailside Museum, Ward Pound Ridge Reservation, Cross River, New York.
- ## Personal Communications
- Behr, Betty M. Light
1990 Letter of October 3, 1990, to Nancy L. Gibbs, Sheffield Archaeological Consultants, Butler, New Jersey. Mrs. Behr is the Associate Historian for the Town of Kent.
- Muscarella, Richard
1990 Letter of October 5, 1990 to Edward J. Lenik, Sheffield Archaeological Consultants. Mr. Muscarella is the Town of Kent Historian.
- Reich, Carol
1988 Personal communication with Edward J. Lenik. Ms. Reich is a former resident of the area.
- Sypher, Sallie
1990 Personal communication, Mahopac Falls, New York. Ms. Sypher is the Putnam County, New York, Historian.

Aboriginal Petroglyphs at Greene Point, New York

Michael F. Laccetti, Van Epps-Hartley Chapter, NYSAA

Excavation has revealed that a Hudson River multicomponent site located on a shoreline in Greene County, New York, was occupied by Native Americans of the Archaic, Transitional, and Late Woodland periods who engaged in hunting, fishing, and gathering in the nearby locale. In a shell heap overlying part of the earlier occupations, fragments of Owasco pottery and two small stone petroglyphs were discovered. The inscriptions on the petroglyphs are geometric, appearing simplistic, and are of Late Woodland provenience. Their cultural role is difficult to ascertain, but they may have been used to communicate with similar or different cultural complexes or served to define cultural boundaries in the Northeast.

Introduction

On a shoreline heavily eroded by the tides and heavy marine traffic of the Hudson River, the small habitation site south of Catskill, New York, was discovered by Kevin Kelly of Athens, New York. Nearby, a large, abandoned and burned wooden barge serves to mark the site on a bay, which at present abounds with mussels, turtles, migratory ducks, geese, and cranes.

Stratigraphy

A total of 18 squares was subsequently excavated during two successive summers by students enrolled in the nearby Columbia-Greene Community College summer program. The site surface was littered with modern debris: nails, wire, glass, rusted tools, utensils, and spent cartridge cases. Excavating in 6 in (15.2-cm) intervals uncovered an undisturbed sequence of Hudson River occupations identified by Late Woodland ceramics and the earlier projectile points of the Orient, Normanskill, Brewerton, and Lamoka stages (Ritchie 1971:10). A heavy occupation of the Brewerton stratum was evident by its concentration of typical rough stone artifacts of the Archaic Period, namely, small ovate and lanceolate knives, small sandstone mortars, hammerstones, anvils, abraders, net sinkers, pestle fragments, celts, and adzes (Ritchie 1980:31-117). The presence of Mussel shells in all stratigraphic levels indicates a heavy reliance on mollusks for food. Deer bone, while present, is not abundant. Local Normanskill flint had been heavily utilized in manufacturing chipped stone weapons and implements, and it appears profusely in the debris as loose clusters of flint flakes.

Discussion

While excavating a shell heap in the northern quadrant of the site, Kevin Kelly recovered fragments of clay pottery and two objects of siltstone bearing straight, uniform lines on their surfaces. Photographs of the stone objects were taken with a Nikon F camera, a 55 mm Micro-Nikkor lens, and Plus-X film. Tungsten lighting on the objects was oblique. The obverse of the largest petroglyph shows design patterns of rhomboidal markings and a number of erratic incisions (Figure 1). Its reverse side has similar patterns (Figure 2). The second and much smaller inscribed object is a petroglyph fragment. Its reverse side is unmarked (Figure 3).

Interpretations

On examination of the photographs and the siltstone objects at the New York Museum Science Service in Albany, New York, staff members offered a number of observations: the markings on the artifacts are not found on sedimentary rocks, nor do the objects appear to have been fractured, but they had been "scribed," "incised," or "scored;" the markings are uncommon; they are not recent; they show weathering; flint chips could have made the marks; the objects are real, unique, and could be Owasco in provenience. A possible source of soft siltstone in the Hudson Valley region is described within the Austin Glen A Facies (Normanskillian) as graywacke, subgraywacke, and calcareous siltstones alternating with silt and micaceous gray shales (Fisher 1977:32).

The presence of the inscribed objects in association with a netsinker and pieces of pottery in the shell heap is of temporal significance. The pottery fragments exhibit the corded-stick ornamentation characteristic of the Late Woodland Owasco series. These are short, oblique, linear impressions of corded horizontal impressions encircling the neck and obliquely corded pot-rim interiors (Ritchie and MacNeish 1949:107).

The Greene Point inscribed finds are intriguing, but more answers are needed to understand their purpose. The technique of fine-line incising to produce a delicate design on stone appears elsewhere. The unique Rocklein slate tablet from Locus 3 of an Early Archaic site in Sussex County, New Jersey, is also inscribed by a flint flake. On its obverse side is a complex design of vertical columns and rows. Its reverse side is randomly incised.

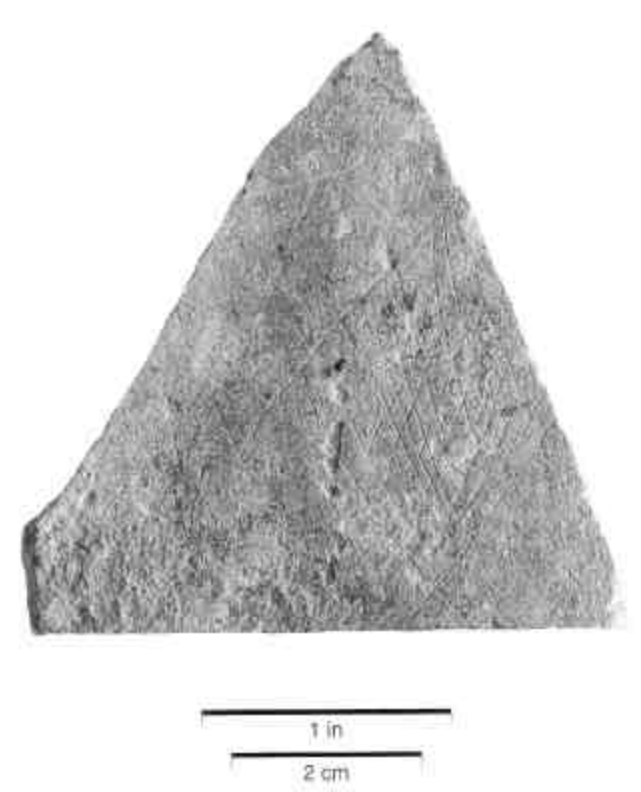


Figure 1. Greene Point Petroglyph No. 1, obverse.

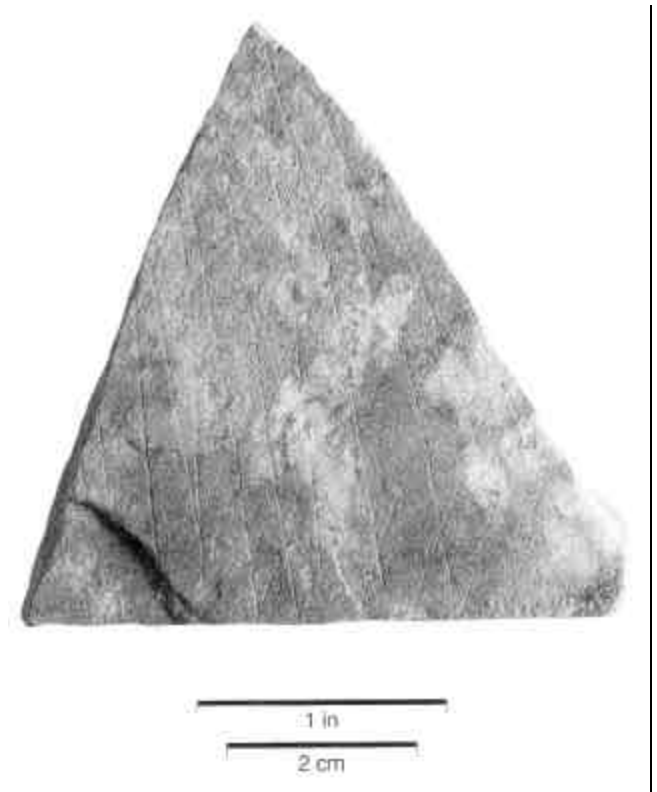


Figure 2. Greene Point Petroglyph No. 1, reverse.

However, the function of slate tablets in the Archaic culture is totally unknown (Dumont 1979:49-50).

In addition to zoomorphic petroglyphs, those with geometric motifs are represented on massive stone surfaces at natural sites used by Native Americans. In the Lower Susquehanna Valley, petroglyphs located on the borders of three archeological complexes (the Minguannan, Shenks Ferry, and Susquehannock, c. A.D. 1000-1600) have recently been analyzed (Custer 1989). Design rules similar to those on the ceramics of the Minguannan complex suggest a late prehistoric origin of the petroglyphs. These may have functioned as markers of cultural boundaries during Late Woodland times (Custer 1989:79, 87). At Walnut Island in the Safe Harbor area of the Susquehanna River, petroglyphs bear a series of geometric design motifs containing not only complex design elements in intricate systems of straight line designs having quadrilateral symmetry, but they also evidence a system of design composition by which the constituent parts and unfinished design elements as well would generate other geometric designs (Custer 1989:81).

Conclusions

The geographic distribution of geometric elements in this class of inscribed symbols may be esoteric and confined to a few



Figure 3. Greene Point Petroglyph No. 2, obverse.

locales, or they, may extend over large areas. It might be said these petroglyphs could have served as a boundary marker or a presence for other cultural complexes, but to us they may remain enigmatic and perhaps undecipherable. The appearance of the Greene Point petroglyph motif in an even wider cultural context as an expression of human activities would have some implications for the prehistory of northeastern North America.

Acknowledgments

The author wishes to express his gratitude to the members of the New York State Science Service, Dr. Robert E. Funk, and both Edward Landing and William Rogers, a sedimentologist, of the Geologic Survey at Albany, New York, for their interest and comments on the objects described in the text as well as the helpful suggestions made by Donald W. Fisher, New York State Paleontologist (retired). My thanks are also extended to Kevin Kelly, not only for obtaining permission from the landowner, Mr. John Delaney of New York City, to excavate the site, but also for having others help in the discoveries of an archeological dig. Finally, many thanks are due to Mr. Jerry Smith of Catskill, New York, for the exceptional photography.

References Cited

- Custer, Jay F.
1989 A New Look at the Petroglyphs of the Lower Susquehanna Valley. *Archeology of Eastern North America* 17:79-87. Partners' Press, Buffalo, New York.
- Dumont, Elizabeth M.
1979 Of Paradigms and Projectile Points: Two Perspectives on the Early Archaic in the Northeast. *The Bulletin*. New York State Archeological Association 75:38-52.
- Fisher, Donald W.
1977 *Correlation of the Hadrynian, Cambrian and Ordovician Rocks in New York State*. New York State Museum. Map and Chart Series Number 25. University of the State of New York, Albany.
- Ritchie, William A.
1971 A Topology and Nomenclature for New York Projectile Points. Bulletin Number 384. New York State Museum and Science Service, Albany.
1980 *The Archeology of New York State*. Revised Edition. Harbor Hill Books. Harrison, New York.
- Ritchie, William and Richard S. MacNeish
1949 The Pre-Iroquoian Pottery of New York State. *American Antiquity* 15(2):97-124.

Late Pleistocene and Holocene Vertebrates from Joralemon's (Fish Club) Cave, Albany County, New York

David W. Steadman and Lyda J. Craig, Biological Survey, New York State Museum, and Thomas Engel, New York State Department of Environmental Conservation

At least 35 species of fish, amphibians, reptiles, birds, and mammals were recovered from excavations conducted in 1988 and 1990 at Joralemon's Cave, Town of Coeymans, Albany County, New York. Formerly known as Fish Club Cave, this site was excavated initially in 1962-1964 by R.E. Funk and R.A. Johnson, who reported bones of white-tailed deer (96% of all bones) and five other species associated with lithic artifacts of Woodland and Late Archaic age. Our more recent excavations yielded bones of one species that no longer occurs in New York State (*Neotoma magister*, Allegheny woodrat) and three other species that either are absent or extremely rare within 70-20 km of the site (*Crotalus horridus*, timber rattlesnake, *Synaptomys cooperi*, southern bog lemming; *Ursus americanus*, black bear). Our larger, faunal assemblage, obtained from a much smaller volume of excavated sediment, reflects: 1) the use of fine-mesh (1/16-in) screens; 2) faunal and cultural differences between the front and back of the cave; and 3) a search image oriented as much to bones as artifacts. While Joralemon's Cave clearly is an archaeological site, it is also partly paleontological in origin (i.e., it contains bones deposited by non-human means). We believe that the vertebrate faunas from most "archaeological" sites in caves and rockshelters include a significant paleontological component that should be regarded as such when interpreting faunal assemblages in terms of human subsistence.

Introduction

During 1962-1964, R.E. Funk and R.A. Johnson excavated a site known as Fish Club Cave in the Town of Coeymans, Albany County, New York (Funk 1976:61-63). The cave entrance faces Albany County Route 102, about 500 m north of the intersection of State Route 143, and 5 km west of the Hudson River (Ravena 7.5' quad.; 42°28'15" N, 73°51'45" W; elevation 100 m). The cave and surrounding property are owned by the Town of Coeymans. The immediate area around the cave is mostly forested with trees such as eastern white pine (*Pinus strobus*), eastern white cedar (*Thuja occidentalis*), sugar maple (*Acer saccharum*), basswood (*Tilia americana*), black cherry (*Prunus serotina*), hackberry (*Celtis occidentalis*), ash (*Fraxinus* sp.), hophornbeam (*Ostrya virginia*), shagbark hickory (*Carya ovata*), red oak (*Quercus rubra*), and white oak (*Q. alba*).

Funk and Johnson's excavations (Figure 1) produced lithic and ceramic artifacts that range in age from Middle Woodland to Middle/Late Archaic, perhaps c. 1000 to 5000 yr

B.P. Layer I yielded a single Middle Woodland potsherd and historic (European) trash. Layer II produced many temporally diagnostic artifacts, ranging from four Otter Creek points (Middle to Late Archaic) in deep levels to Middle Woodland projectile points and potsherds in upper levels. The 417 bones recovered in 1962-1964 from Layers I and II, identified by E. M. Reilly, Jr., represented sturgeon (*Acipenser* sp., 1 bone), turtle (*Emydidae* sp. 5 bones), wild turkey (*Meleagris gallopavo*, 2 bones), red fox (*Vulpes vulpes*, 3 bones), black bear (*Ursus americanus*, 3 bones), and white-tailed deer (*Odocoileus virginianus*, 403 bones).

During 1988 and 1990, we excavated a different part of this cave, which is known today as Joralemon's Cave. Our research focused on two general locations: Joralemon's Backdoor Cave, a small cave where only surface bones were collected; and Joralemon's Cave (the original Fish Club Cave), where bones were collected from the surface and two test pits near the rear of the cave (Figure 1). Both caves occur in the same outcrop of Middle Devonian Onondaga limestone.

Joralemon's Backdoor Cave begins with a small (0.5 m high x 1.4 m wide) northwest-facing entrance approximately 70 m northeast of the southwest-facing entrance of Joralemon's Cave (Figures 2 and 3). Based on their orientation, it seems highly likely that the two caves in fact represent a single larger cave whose narrow mid-section became completely choked with sediment carried by glacial meltwater. Scalloping on the walls of both caves indicates that most or all of the passage was inundated at the time of glacial retreat. Curl (1966) showed that such scallops are solutional features with their steep side always on the upstream side of the paleo-channel. Thus the glacial meltwater must have entered Joralemon's Backdoor Cave, flowed through the choked passage between the two caves, and exited through the present entrance of Joralemon's Cave, which is 1.8 m high and 2.8 m wide (roughly triangular in cross-section but completely obscured on the bottom by sediment).

Stratigraphy

In 1988 and 1990, we excavated two test pits (TP1: 1.0 m x 0.8 m; TP2: 1.0 m x 0.1 m (left side) to 0.8 m (right side) along the southeast wall of Joralemon's Cave, 21 m from the entrance (Figure 1). The stratigraphy is similar in our two test pits. Using the terminology of Funk (1976:61-63), Layer I is missing in our excavations (see below). Layer II (0-12/18 cm in TP1; 0-16 cm in TP2) is an unstratified, slightly organic unit of apparent Holocene

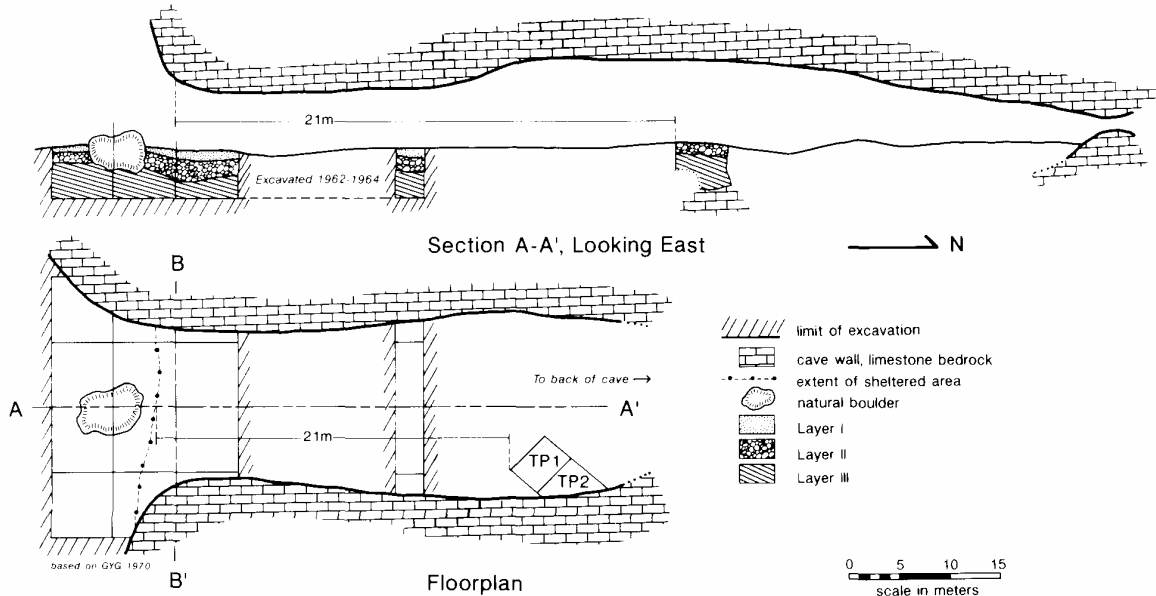


Figure 1. Cross section and plan view of Joralemon's (Fish Club) Cave, Albany County, New York, showing locations of excavations. Modified from Figure 7 of Funk (1976).

age. No temporally diagnostic artifacts were recovered from Layer II. The sediment is dark grayish brown (wet), light olivish gray (dry), slightly compacted, pebbly, slightly sandy, slightly clayey silt. The small (mostly <3 cm diameter) angular and subangular clasts are of limestone and chert derived from the roof and walls of the cave. Layer III (12/18-40+ cm in TPI; 16-80 cm in TP2) is a compacted, vaguely stratified, inorganic unit of apparent late Pleistocene age. Lacking artifacts, Layer III is medium yellowish brown (wet), light yellowish gray (dry), very compacted, slightly bouldery, cobbly, pebbly, slightly sandy, clayey silt. The clasts are extremely variable in size and range from rounded to angular. Unlike in Layer II, the clasts in Layer III include extra-local noncarbonate rocks, presumably of glacial origin, such as shales, graywacke, quartz, and other granitic or metamorphic rocks and minerals. At a depth of 80 cm in TP2 we encountered either the irregular floor of the cave or angular limestone cobbles packed so tightly that they could not be distinguished from the actual floor.

The stratigraphy in TPI and TP2 differs from that of the 1962 excavations in that all three major strata become thinner as one goes deeper into the cave. Layer I, described by Funk (1976:62) as "flint debris, modern trash, leaves & black soil" up to 6 inches (15 cm) thick, is absent in TPI and TP2. Layer II, described by Funk (1976:62) as "occupation zone, much rubble, refuse and artifacts, grey-brown to black," was up to 28 inches (71 cm) thick in Funk's excavations but never thicker than 18 cm in ours. Layer III, described by Funk (1976:62) as "sterile yellow silt," is the glacial unit described above. It reaches a

thickness of at least 54 inches (129 cm) near the entrance but no more than 64 cm in TP2. Pollen samples were collected, prepared, and examined by D.A. Burney. Layer II contained pollen typical of Holocene sediments while Layer III, as is typical of high energy fluvial deposits in caves, had no pollen.

Faunal Assemblage

We recovered 273 identifiable bones that represent at least 35 species of fish, amphibians, reptiles, birds, and mammals (Tables 1 and 2). Because of their similar stratigraphy, we combined the bones from TP1 and TP2 when compiling Tables 1 and 2. The entire bone collection from Joralemon's Cave and Joralemon's Backdoor Cave is catalogued in the New York State Museum Vertebrate Paleontology Collection as NYSM 44814661 and 5180-5241. We identified the bones through comparisons with modern skeletons of amphibians, reptiles, birds, and mammals in the NYSM collections, supplemented by skeletons from the American Museum of Natural History (New York) and the National Museum of Natural History, Smithsonian Institution (Washington, D.C.).

The fish bones include four bony scales (osteoderms) from sturgeon (*Acipenser* sp.), a popular Amerindian food item into European times along the Hudson River (Kalm 1770:352, 353). The remaining fish bones consist of various elements from very small species. The entrance of Joralemon's Cave is only 25 m

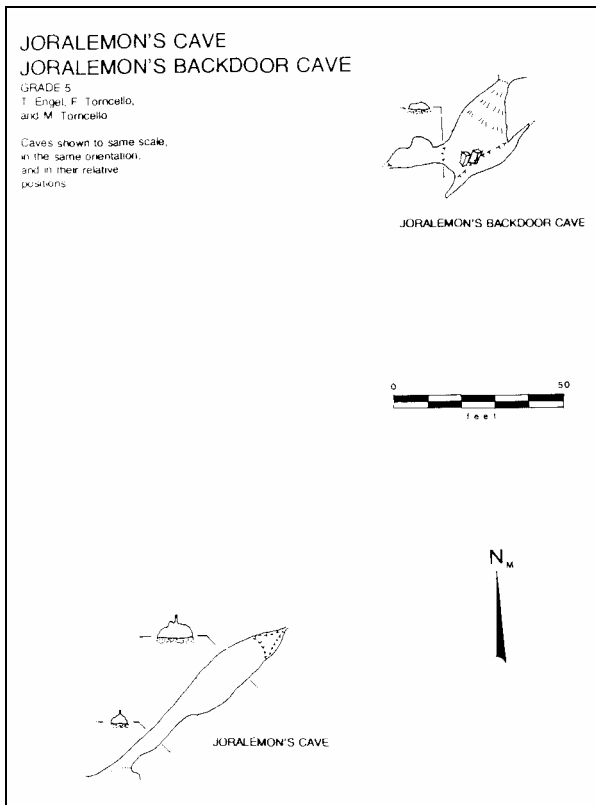


Figure 2. Plan view of Joralemon's Cave and Joralemon's Backdoor Cave. Caves shown to same scale, in the same orientation, and in their relative positions. Grade 5. T. Engel, F. Torncello and M. Torncello.

from Hannacrois Creek, a tributary of the Hudson River that probably supports a diverse assemblage of small freshwater fish. While sturgeon probably were brought to the cave by humans from the Hudson River, the smaller fish may have been deposited in the cave by other predators or scavengers, such as mink, skunks, or raccoons.

Amphibians are represented by 21 bones of toads and frogs, only one of which (an ilium of the leopard frog *Rana pipiens*) could be identified to species. The nearby creek and moist wood lands provide suitable habitat for anurans, most species of which are difficult to identify without the ilium or cranial elements. The 11 bones of reptiles include carapace and plastron elements of an unknown emydid turtle and vertebrae from an unknown colubrid (non-poisonous) snake and the timber rattlesnake *Crotalus horridus*.

We recovered only four bird bones. The Red-tailed Hawk *Buteo jamaicensis* (distal end of tarsometatarsus) still is common throughout the region. Not dependent on large tracts of forest, the Red-tailed Hawk has been found less commonly than the forest-

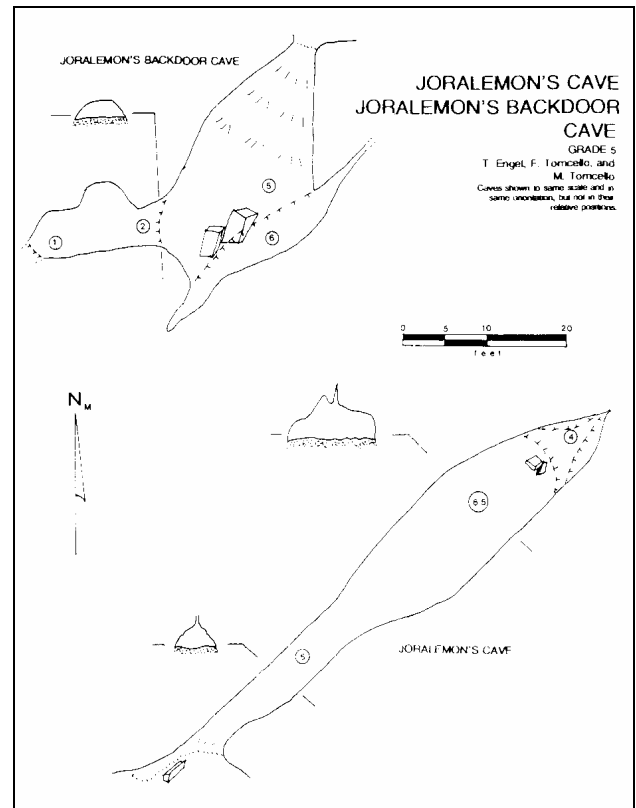


Figure 3. More detailed plan view of Joralemon's Cave and Joralemon's Backdoor Cave. Caves shown to same scale, in the same orientation, but not in their relative positions. Grade 5. T. Engel, F. Torncello and M. Torncello.

dwelling Red-shouldered Hawk *Buteo lineatus* in New York State archaeological sites (Steadman 1988a), The Ruffed Grouse *Bonasa umbellus*, reported herein from a coracoid, and the Wild Turkey *Meleagris gallopavo* (two bones reported by Funk 1976), are both common in New York State's prehistoric sites (Steadman 1988a, b). These two gallinaceous species have been popular game birds for thousands of years. The absence at Joralemon's Cave of bones from the Passenger Pigeon *Ectopistes migratorius* is surprising, given its abundance in many other prehistoric sites (Steadman 1988a) and the favorable habitat (deciduous forest) that surrounds Joralemon's Cave. The Eastern Phoebe *Sayornis phoebe* is represented by a coracoid and ulna. This common flycatcher nested during 1988-1991 on a small rock ledge at the entrance of Joralemon's Cave. This is the first record of Eastern Phoebe from New York State from a possibly prehistoric context.

The 225 identifiable mammal bones represent 25 taxa. Bat bones make up 57% of all mammal bones. The most common species is the big brown bat *Eptesicus fuscus* (24.8% of all bones).

Table 1. Summary of Bones from Joralemon's Cave, Town of Coeymans, Albany County, New York.

Species		Bkdr	Surf	II	III	Total NISP	% of Total
Fish							
<i>Acipenser</i> sp.	Sturgeon	2	2	0	0	4	1.5
<i>Osteichthyes</i> sp.	Unknown small fish	0	2	10	1	13	4.7
Amphibians							
<i>Bufo</i> sp.	Toad	0	0	1	0	1	0.4
<i>Rana pipiens</i>	Leopard frog	0	0	1	0	1	0.4
* <i>Rana</i> sp.	Frog	1	0	3	2	6	2.2
* <i>Anura</i> sp.	Frog/toad	0	5	8	0	13	4.7
Reptiles							
<i>Emydidae</i> sp.	Freshwater turtle	1	3	0	0	4	1.5
<i>Colubridae</i> sp.	Colubrid snake	0	5	0	0	5	1.8
<i>Crotalus horridus</i>	Timber Rattlesnake	0	1	0	1	2	0.7
Birds							
<i>Buteo jamaicensis</i>	Red-tailed Hawk	0	0	1	0	1	0.4
<i>Bonasa umbellus</i>	Ruffed Grouse	0	0	1	0	1	0.4
<i>Sayornis phoebe</i>	Eastern Phoebe	1	1	0	0	2	0.7
Mammals							
<i>Didelphis virginianus</i>	Opossum	1	0	0	0	1	0.4
<i>Blarina brevicauda</i>	Short-tailed shrew	0	0	4	0	4	1.5
<i>Talpidae</i> sp.	Mole	0	1	1	0	2	0.7
<i>Myotis</i> sp.	Small bat	0	5	48	5	58	21.2
<i>Eptesicus fuscus</i>	Big brown bat	0	11	52	5	68	24.8
<i>Ursus americanus</i>	Black bear	1	1	1	3	6	2.2
<i>Procyon lotor</i>	Raccoon	2	1	0	0	3	1.1
<i>Mustelidae</i> sp.	Weasel/skunk	0	1	0	0	1	0.4
<i>Canidae</i> sp.	Dog/fox	4	0	1	0	5	1.8
<i>Canis</i> sp.	Dog/wolf	3	0	0	0	3	1.1
<i>Marmota monax</i>	Woodchuck	1	0	0	0	1	0.4
<i>Tamias striatus</i>	Eastern chipmunk	0	0	1	0	1	0.4
<i>Tamiasciurus hudsonicus</i>	Red squirrel	0	1	0	0	1	0.4
<i>Sciurus carolinensis</i>	Gray squirrel	1	0	8	0	9	3.3
<i>Glaucomys volans</i>	Southern flying squirrel	0	1	0	0	1	0.4
* <i>Glaucomys</i> sp.	Flying squirrel	0	0	2	0	2	0.7
* <i>Sciuridae</i> sp.	Squirrel	0	2	0	0	2	0.7
<i>Castor canadensis</i>	Beaver	0	0	1	0	1	0.4
<i>Peromyscus</i> sp.	White-footed/Deer mouse	0	6	1	0	7	2.6
<i>Neotoma magister</i>	Allegheny woodrat	0	1	4	0	5	1.8
<i>Microtus pennsylvanicus</i>	Meadow vole	0	4	0	0	4	1.5
* <i>Microtus</i> sp.	Vole	0	0	2	0	2	0.7
<i>Synaptomys cooperi</i>	Southern bog lemming	0	1	0	0	1	0.4
<i>Ondatra zibethica</i>	Muskrat	1	1	0	0	2	0.7
* <i>Arvicolinae</i> sp.	Vole	0	0	2	0	2	0.7
* <i>Cricetid</i> rodent sp.	Cricetid rodent	0	3	1	0	4	1.5
* <i>Rodentia</i> sp.	Small rodent	0	2	2	1	5	2.2
<i>Sylvilagus floridanus</i>	Eastern cottontail	0	0	1	0	1	0.4
<i>Sus scrofa</i> (i)	Pig	0	0	1	0	1	0.4
<i>Odocoileus virginianus</i>	White-tailed deer	10	1	3	0	14	5.1
<i>Equus caballus</i> (i)	Horse	3	0	0	0	3	1.1
Sub-totals							
Fish		2	4	10	1	17	6.2
Amphibians		1	5	13	2	21	7.7
Reptiles		1	9	0	1	11	4.0
Birds		1	1	2	0	4	1.5
Mammals		27	43	136	14	220	80.7
Grand total		35	62	161	18	273	100.0

Numbers represent NISP (number of identified specimens)

Bkdr = Joralemon's Backdoor Cave From Joralemon's Cave; Surf = Surface; II = Layer II; and III = Layer III

i = European introduction

* = not necessarily different from a more specifically identified taxon in this table.

Table 2. Summary of Bones from Joralemon's Cave, Town of Coeymans, Albany County, New York.

	Total Bones	% of Total
<i>Eptesicus fuscus</i>	68	24.8
<i>Myotis</i> sp.	58	21.2
<i>Odocoileus virginianus</i>	14	5.1
<i>Osteichthyes</i> sp.	13	4.7
<i>Anura</i> sp.	13	4.7
<i>Sciurus carolinensis</i>	9	3.3
<i>Peromyscus</i> sp.	7	3.1
<i>Rana</i> sp.	6	2.2
<i>Ursus americanus</i>	6	2.2
Rodentia sp.	5	1.8
Colubridae sp.	5	1.8
Canidae sp.	5	1.8
<i>Neotoma magister</i>	5	1.8
<i>Acipenser</i> sp.	4	1.5
Emydidae sp.	4	1.5
Cricetidae sp.	4	1.5
<i>Microtus pennsylvanicus</i>	4	1.5
<i>Blarina brevicauda</i>	4	1.5
<i>Equus caballus</i> (i)	3	1.1
<i>Canis</i> sp.	3	1.1
<i>Procyon lotor</i>	3	1.1
<i>Crotalus horridus</i>	2	0.7
<i>Sayornis phoebe</i>	2	0.7
Sciuridae sp.	2	0.7
Talpidae sp.	2	0.7
<i>Microtus</i> sp.	2	0.7
<i>Ondatra zibethica</i>	2	0.7
<i>Glaucomys</i> sp.	2	0.7
Arvicolinae sp.	2	0.7
<i>Bufo</i> sp.	1	0.4
<i>Rana pipiens</i>	1	0.4
<i>Buteo jamaicensis</i>	1	0.4
<i>Bonania umbellus</i>	1	0.4
<i>Tamiasciurus hudsonicus</i>	1	0.4
<i>Synaptomys cooperi</i>	1	0.4
Mustelidae sp.	1	0.4
<i>Sylvilagus floridanus</i>	1	0.4
<i>Didelphis virginianus</i>	1	0.4
<i>Marmota monax</i>	1	0.4
<i>Castor canadensis</i>	1	0.4
<i>Tamias striatus</i>	1	0.4
<i>Glaucomys volans</i>	1	0.4
<i>Sus scrofa</i> (i)	1	0.4
Grand total	273	100.0

Species arranged in order of dominance
i = European introduction

The second most common bat is *Myotis* spp. (21.2% of all bones). The species of *Myotis* that occur in New York State are difficult to distinguish osteologically. Not included here are several hundred non-diagnostic bat bones, mostly fragmentary wing elements that occurred throughout the surface and Layer II. The white-tailed deer *Odocoileus virginianus* is the third most common taxon, with 51 % of the total bones.

There are major differences among the mammalian faunas from Joralemon's Backdoor Cave and Joralemon's Cave. Twenty-five of 28 bones from the Backdoor Cave were from medium to large mammals, 10 of these being deer bones. The Backdoor Cave contained 71% of all deer bones found at both sites in 1988 and 1990. No bat or small mammal bones were present at the Backdoor Cave, which did include the only bones of *Equus caballus*, the European-introduced horse.

The surface of Joralemon's Cave yielded 43 bones, the majority from bats and other small mammals. A single bone of the pig *Sus scrofa* represents the main cave's only definite indicator of European times. The most abundant species on the surface was the big brown bat *Eptesicus fuscus*, which made up 25% of all bones. Other small mammals were well represented by surface bones.

Layer II of Joralemon's Cave, again dominated by the bats *Eptesicus fuscus* and *Myotis* sp., was the richest source of bones. It contained 61% of all -bones collected from both sites, yielding a bone concentration of 843 identifiable bones per cubic meter of excavated sediment in TPI and TP2.

The faunal assemblage from the late Pleistocene Layer III differs from that of Holocene Layer II. Layer III produced only 19 identifiable bones (10 of them from bats), yielding a bone concentration of 42 bones per cubic meter. The five bones from Layer III of the black bear *Ursus americanus* are grayer and more mineralized than bones from Layer II. From Layer III we also recovered approximately 100 extremely fragmentary bits of long bone from large mammals, preserved similarly to the black bear bones. There is no reason to believe that these undiagnostic fragments represent any species other than *Ursus americanus*, the only large mammal recorded with certainty from Layer III. Because of differences in preservation, we believe that all the diagnostic bones from Layer III other than those of *Ursus americanus* are contaminants that originally were deposited in Layer II.

Discussion

Each species of vertebrate recovered from Joralemon's Cave occurs in the immediate vicinity (2 km radius of the cave) today, with four exceptions. First, we are unaware of any previous modern or historic records of the timber rattlesnake *Crotalus horridus* from the Town of Coeymans. While traveling up the Hudson River in 1749, Swedish botanist Peter Kahn mentioned

often mountainous regions. The record from Joralemon's Cave indicates, as one would expect, a more generalized distribution in pre-European times.

Second, the black bear *Ursus americanus* is extirpated locally or nearly so, although stray individuals occur at higher elevations, perhaps 15 km to the west. The nearest resident population is in the Catskill Mountains, at least 25 km to the west-southwest. Bones of *Ursus americanus* were recovered from both the Backdoor Cave and from the surface, Layer II, and Layer III of Joralemon's Cave, suggesting a long period of residency in the region.

Third, Joralemon's Cave represents a northern range extension for the Allegheny woodrat *Neotoma magister*. The five bones of *N. magister* include a maxilla with M 12, humerus, ulna, metacarpal, and metatarsal. The nearest historic record in eastern New York is 75 km south of Joralemon's Cave (Ulster County, Rosendale Township, single specimen collected in 1965; in possession of A. Angstrom, SUNY-New Paltz; A. Hicks, personal communication). This distinctive rodent is common in prehistoric sites of the lower Hudson drainage, such as Dutchess Quarry Cave No. 1 (Guilday 1969) and No. 8 (Steadman and Funk 1987) and Hansen Rockshelter (DWS, pers. obs.). The Allegheny woodrat has declined in the past few decades along the northern margin of its range. The last population in New York State, from Orange County, died out in 1987. The nearest locality for extant woodrats is New Jersey's last remaining population, in talus at the base of the Palisades, Bergen County (Sciascia 1990). While not dated other than being Holocene, the woodrat bones from Joralemon's Cave (along with recently discovered, undated bones of *N. magister* from Diddy Cave, Clarksville, Albany County) demonstrate that the decline in distribution of this species has been greater than previously suspected. The rocky, forested terrain near Joralemon's Cave seems suitable for woodrats, based upon descriptions of their preferred habitat in the northeast (McGinley 1984; Poole 1940; Rainey 1956). Unfavorable climate, in the form of very cold and snowy winters, is believed to have a deleterious impact on woodrat populations (Fitch and Rainey 1956). While the severity of winter seems unlikely to explain the current decline of *N. magister*, it may have been a primary factor in determining the northern limit of the eastern woodrat's range in prehistoric times.

Fourth, we are aware of only three specimens of the southern bog lemming *Synaptomys cooperi* from Albany or Rensselaer counties, and none from Greene County. Two are from the Town of Berlin, Rensselaer County (26 August 1953, NYSM 16705; 3 July 1990, NYSM 5777), and one is from the Town of Rensselaerville, Albany County (17 August 1938, NYSM 6039). Both of these localities are at about 500 m elevation, with a more boreal flora than exists near Joralemon's Cave (elevation 100 m). A mammal survey carried out by NYSM during 1989-1990 failed to locate any additional records of *S. cooperi* in Albany or Rensselaer counties. *Synaptomys cooperi* tends to be captured infrequently. This can be attributed to low "catchability" (i.e., it is difficult to capture using standard trapping methods) and

to the fact that this rodent usually is distributed patchily in small, isolated populations (P.F. Steblein, personal communication). Although the actual status of the southern bog lemming in eastern New York is poorly known, it may not be present today within 10-20 km of Joralemon's Cave.

From the standpoint of numbers of species, the fauna from Joralemon's Cave is one of the richest Holocene vertebrate faunas from New York State. It is exceeded in number of species by Dutchess Quarry Cave No. 1 (44 species; Guilday 1969), Dutchess Quarry Cave No. 8 (42 species; Steadman and Funk 1987), Lamoka Lake (43 species; Guilday 1980), and the Hiscock Site (48 species; Steadman 1988b). If similar amounts of sediment from Joralemon's Cave were fine-screened for microvertebrates, its fauna would likely be comparable in species richness to those just mentioned. Layer III of Joralemon's Cave is similar to all currently known late Pleistocene sites in New York State in having few species and being dominated by large mammals. Among the factors contributing to this bias are the high energy depositional environment, the difficulty of recovering small bones in clayey sediment, and the small volume of sieved sediment.

The vertebrate assemblage from Joralemon's Cave raises questions about cultural (human) versus non-cultural deposition of bones in caves. As noted in the Introduction, the 417 bones recovered from the original excavations at Joralemon's Cave in 1962-1964 represented 6 species obtained from a total volume of approximately 55 cubic meter of sediment. Our assemblage of 35 species was obtained from only 273 bones recovered from surface collections and a much smaller volume of sediment (0.68 cubic meters). Several factors account for this difference in recovery of vertebrate remains: 1) our use of fine-mesh (1/16-in) screens rather than 1/4-in or 1/2-in mesh screens; 2) a search image oriented as much toward bones as artifacts; and 3) different fauna composition near the entrance versus deeper within the cave.

While Joralemon's Cave is undeniably an archaeological site, it is a paleontological site as well (i.e., it contains bones deposited by non-human agents). We believe that the vertebrate faunas from most "archaeological" sites in caves and rockshelters contain a significant paleontological component in the form of bats (deposited mainly through natural mortality) and various other small vertebrates deposited by avian and mammalian predators. Faunal analysts should attempt to determine which bones may be non-anthropogenic, particularly since an important aspect of zooarchaeology is interpreting faunas in terms of human subsistence. This difficult problem becomes even more challenging when bones of very small species are recovered.

In the case of Joralemon's Cave, no bones collected in 1988 and 1990, other than those of *Odocoileus virginianus* and *Canis* sp., have butcher marks or distinctive breakage patterns that would argue for human consumption. While bones of many species show gnaw marks of large rodents, this argues neither for nor against human consumption. Both Joralemon's Cave and Joralemon's Backdoor Cave are cold, wet, and dark except near

the entrance. Thus it is easy to see why artifacts would be concentrated near the entrance rather than deeper within the caves. Likewise, the coldness, wetness, and darkness of these caves help to explain the more common occurrence of typical Amerindian food species near the entrance of Joralemon's Cave. Many other species, more likely to have been deposited by nonhuman predators, were found deeper in the cave.

Acknowledgments

We thank officials of the Town of Coeymans for permission to conduct research at Joralemon's Cave. For assistance during field work, we thank Joseph Bopp, Marilyn Buckley, David and Mara Burney, Robert Funk, Anita Goetz, Faith Kostel-Hughes, Norton Miller, Paul Steblein, and Marie Zarriello. We are grateful to Frank and Marge Tornello for help in mapping the cave. Richard Tedford confirmed that the Pleistocene bear bones represented *Ursus americanus* rather than an extinct species. Gordon Tucker reviewed botanical names. David Burney prepared and examined pollen samples. Figure 1 was drafted by Patricia Kernan. The manuscript was improved by comments from David Burney, Robert Funk, AI Hicks, Norton Miller, and Paul Steblein. This is contribution number 696 of the New York State Museum and Science Service.

References Cited

- Curl, R.L.
1966 Scallops and Flutes. *Transactions of the Cave Research Group of Great Britain* 7:121-160.
- Fitch, H.S. and D.G. Rainey
1956 Ecological Observations on the Woodrat. *Neotoma floridans*. *University of Kansas Publications, Museum of Natural History* 8:499-533.
- Funk, R.E.
1976 Fish Club Cave (Cox 6). In R. E. Funk, *Recent Contributions to Hudson Valley Prehistory*, pp. 61-63. New York State Museum Memoir 22.
- Guilday, J.E.
1969 Faunal Remains from Dutchess Quarry Cave No. I. In R.E. Funk, G.R. Walters, and W.F. Ehlers, Jr. *The Archaeology of Dutchess Quarry Cave, Orange County, New York*, pp. 17-19. *Pennsylvania Archaeologist* 39:7-22.
- Guilday, J.E.
1980 Bone Refuse from the Lamoka Lake Site. In W. A. Ritchie. *The Archaeology of New York State*, pp. 54-59. Harbor Hill Books, Harrison, New York.
- Kalm, P.
1770 *Peter Kalm's Travels in North America*. Reprint of 1937 and 1964 edited by A.B. Benson. Dover Publications, Inc., New York.
- McGinley, M.A.
1984 Central Place Foraging for Nonfood Items: Determination of the Stick Size-Value Relationship of House Building Materials Collected by Eastern Woodrats. *The American Naturalist* 123:841-853.
- Poole, E.L.
1940 A Life History Sketch of the Allegheny Woodrat. *Journal of Mammalogy* 21:249-270.
- Rainey, D.G.
1956 Eastern Woodrat, *Neotoma floridana*: Life History and Ecology. *University of Kansas Publications, Museum of Natural History* 8:535-646.
- Sciascia, J.
1990 Eastern Woodrat Decline in the Tri-state Area. *Nongame News, Newsletter of the New Jersey Endangered and Nongame Species Program*. Winter 1990:1, 8.
- Steadman, D.W.
1988a Prehistoric Birds of New York State. In R.F. Andrie and J.R. Carroll, editors. *The Atlas of Breeding Birds in New York State*, pp. 19-24. Cornell University Press, Ithaca.
1988b Vertebrates from the Late Quaternary Hiscock Site, Genesee County, New York. *Bulletin of the Buffalo Society of Natural Sciences* 33:95-113.
- Steadman, D.W. and R.E. Funk
1987 New Paleontological and Archaeological Investigations at Dutchess Quarry Cave No. 8, Orange County, New York. *Current Research in the Pleistocene* 4:118-120.

The Lenape and Other "Delawarean" Peoples at the Time of European Contact: Population Estimates Derived from Archaeological and Historical Sources

Marshall Joseph Becker, Department of Anthropology and Sociology, West Chester University

Estimates of population for the various groups identified as "Delaware" are unclear about which peoples were included and where territorial borders were located. Even the subsistence systems of these people were poorly known, further limiting our ability to determine reasonable estimates of the populations identified within the wide range often cited. By identifying the specific cultures often called Delaware, ranging from the lower Hudson River to central Delaware state, detailed studies of each can be conducted and their separate histories known.

Archaeological and ethnohistorical research in the lower Delaware Valley permits a detailed assessment of the boundaries and adaptive strategies used by the specific peoples before and after contact. These data enable us to address the population question on a level that is culture-specific. This culture-specific view, focusing on the group identified as Lenape, allows us to recognize that the population was stable prior to and after contact, with the possibility of a slight increase in the period 1640-1680. In the post-1680 period, the Lenape and perhaps some of their neighbors, began to expand their foraging areas, and experienced a rapid growth in their numbers. Other peoples now recognized as separate entities can be studied by similar techniques.

Introduction

A popular view of the Native American cultures of the Atlantic coast, held by scholars and laypeople alike, assumes that epidemic diseases acquired through early European contacts severely reduced their populations. This belief also infers that subsequent cultural disorganization, susceptibility to the deleterious effects of alcohol, and warfare led to the destruction of many cultures and the disappearance of the people themselves. Many of these ideas derive from late nineteenth-century inferences rather than the examination of original documents or the archaeological evidence. Prior to 1970, the scanty archaeological record provided little aid in understanding many of these aboriginal cultures and their dynamics at and after the time of contact. Recent reassessments, using original documents and detailed archaeological records, have been based on clearly defined questions regarding these subjects (cf. Goddard 1978). These approaches, plus better understanding of anthropological models, have produced important gains in our understanding of the subject. These findings are reviewed here, with specific attention to a single population who identified themselves as "Lenape."

"Delawareans" and Population Estimates

Many scholars discussing the contact period continue to use the term "Delaware," or variations of that term, to refer to several cultures that were not beginning to conjoin until the nineteenth century. This etic perception (imposed by the observers; Harris 1979:34-41) began with those early European observers who identified all of the people living along the Delaware River as the "River Indians," a term which by 1800 had become generalized as Delaware. Complicating this problem is the use of the term River Indians for several linguistically related Native American cultures occupying the areas along the Hudson River in the seventeenth century. For linguistic and other reasons the inhabitants of both river valleys, and often other groups, are sometimes identified by the term "Delawareans." Kinsey (1975:93) correctly estimated that at least 41 different bands inhabited this general region between the modern state of Delaware and New England, including both river valleys, but he clearly noted that these several peoples were not a unified political entity. Goddard's review (1978:213) also clearly notes that:

The groups here treated [as Delaware] together never formed a single political unit, and the name Delaware, which was first applied only to the Indians of the middle Delaware Valley, was extended to cover all of these groups only after they had migrated away from their eastern homelands.

As Goddard points out, the confusion in understanding Delaware cultural boundaries increased after 1750, by which time a majority of the Lenape and other people who had come to be referred to as Delaware had left their homelands.¹ Historians made no distinction between the three groups of River Indians (Lenape, Munsee, and "Jerseys") and continued to call all of them by the name of the river: Delaware (e.g. Mooney 1928). The three supposed clans, or phratries of the Delaware identified by 1800 clearly derive from these three major cultural groups, a fact which Heckewelder noted in 1818 (1876:51-52), but which was denied by most subsequent observers (see Goddard 1978:222, 225).²

¹ Of considerable interest in this research is the fact that there still survive a few individuals who speak Lenape as well as innumerable Lenape descendants. To them and to their ancestors we owe the courtesy of recognizing their cultural identity and not confusing their ancestors nor their culture with those of other peoples.

By the middle of the twentieth century, the problem of using the term Delaware had been compounded by 300 years of acculturation, so that even descendants of the Lenape, Jerseys, and Munsee began to consider themselves as Delaware, often for external and political purposes.³ However, using an emic approach, or perspective from the Native (Lenape) point of view (Harris 1979:34-41), permits us to use data from within the group to assess social dynamics and outline their borders at the time of contact. Such information is abundant in the original documents but must be elicited in meticulous and time-consuming fashion. The results, however, are rewarding and match quite well with the archaeological evidence.

Two issues are evident as fundamental problems to be resolved before we can make any evaluation of Lenape population. The first concerns the actual boundaries of that group of people who defined themselves as Lenape at the time of European contact, c. 1500-1600, and thereafter. The territorial limits of the Lenape and their neighbors have become better known by reciprocal delineation since description of the territorial configuration of the Lenape also defines a portion of the boundaries of the neighboring groups. Working with the other cultures, each as a separate social and geographical entity, helps to confirm the validity of previous research. The second issue to be addressed concerns the economic base of Lenape society at the time in question. A foraging society, by definition, would have a lower population density than one that is horticultural or practicing low-level agriculture. A review of the evidence, with these concerns being addressed, have enabled us to interpret recent findings regarding Lenape economics in ways which answer many questions previously avoided, and to extend these evaluations to many other peoples in this region.

Boundaries

Documenting the sociopolitical differences between the Lenape and their neighbors has not been an easy chore. Fortunately, the peoples north and east of the Delaware drainage are now clearly recognized as independent cultures, only linguistically related to the southerly groups (Table 1). Recognizing distinctions among the three major populations along the Delaware River has been a task of some dimensions, but the first task in understanding the Lenape was to determine who they were; that is, who was Lenape and who was not as defined socially and geographically. While it is certain that Lenape borders were not sharply demarcated in the modern geopolitical sense, Native American peoples had clear pictures of the general perimeters of their territories. For many Native American cultures the joint use of unclaimed resource areas was common. For the Lenape a large and intermittently used resource area lay between lands clearly identified as their collective home range and the territory of the Munsee. The Munsee (or Minsi) of the upper Delaware River valley clearly are culturally distinct from the Lenape. The delineation of the southern boundary of Munsee territory, north of the Forks of Delaware region in Pennsylvania, and

the demonstration that Munsee was a language distinct from that of Lenape (Becker 1983a) indicate that these are separate peoples.

Through tabulation of all of their land sales (see Becker 1984a, b), delineating Lenape boundaries from within also provided important clues to the holdings of land and membership of neighboring groups (Figure 1). The western boundary of Lenape territory, at the headwaters of the streams feeding the lower Delaware River, abutted the territory of the Susquehannock (Kent 1984). The southern Lenape boundary at old Duck Creek (now the Leipsic River) in Delaware is near the northern limits of the territory of the Ciconicic (Becker 1983b).

Determination of the northern Lenape boundary below the Forks of Delaware (Figure 1) also provided evidence for the distinction between the Lenape and the aboriginal inhabitants of southern New Jersey, here collectively identified as the Jerseys. The earliest accounts of the peoples of southern New Jersey, such as Robert Evelyn's (see Weslager 1954), construed the names of individual bands as representing autonomous tribes. Goddard (1978) and other recent authors clearly recognize that these were distinct bands, but their larger sociopolitical organization has yet to be demonstrated. At this time they are collectively termed Jerseys, in the absence of any historic documentation for the term used for their self identification.

Until 1987, these people of southern New Jersey were generally identified as Lenape, based on documents from after 1737. The final determination that the Lenape and the Jerseys were two different peoples was achieved only recently by examining social interactions, marriage patterns, and kin relationships. The Lenape and these Jerseys had no such relationships at any time up to and including the critical period around 1737 (see Becker 1992a). We can infer that such relationships occur at a high level within a culture but are infrequent between distinct cultural groups.

The area north of the Lehigh River, noted earlier as the Forks of Delaware, was a region never claimed by either the Lenape or

² Of historical interest is the fact that in the mid-nineteenth century, when these *cultures* were still viable, their social boundaries were better known even though they had long before left their aboriginal territories. Thus J.M. Stanley (1852:30) could note that the Munsee in the 1850s were "a small tribe residing with the Delawares [Lenape]." Shortly before her death, Nora Thompson Dean (personal communication) indicated that the informant for some ethnographic accounts of the Delaware recorded around 1900 was a Munsee living among the Delaware. The anthropologist gathering the information made no distinction between the two groups. The resulting confusion continues to cause problems in the interpretation of the literature.

³ One complication in present research relates to the modern Delaware accepting the popular values of the American society of which they now are part. Most "Americans" now perceive foragers as primitive and agriculturalists as civilized. Descriptions of the aboriginal Lenape as foragers is now perceived as denigrating the ancestors, an idea strongly resisted by many contemporary Delaware. Such reconstructions of cultural history are normal aspects of restructuring mythology to conform to changing time and changing concepts by the members of a culture.

the Munsee. This zone includes the rich Reading Prong jasper quarries, an important shared lithic resource procurement area prior to 1650. Access to these jasper deposits and other resources in that area was shared by the Susquehannock, Lenape, Munsee, and Jerseys, but there were no permanent inhabitants occupying the area prior to c. 1720-1730 (Becker 1988a).

In the course of reconstructing the biographies of those Native Americans who took up residence in the Forks about 1720 or 1730, we found that all were recent immigrants and that all had come from southeastern New Jersey (Becker 1987, 1988a). This led to studies of social interactions between the Lenape of Pennsylvania and the aboriginal peoples of southern New Jersey, to determine if they were members of a single cultural unit. The level of interaction

(intermarriage or other social activities) prior to 1760 was under 1% of all documented cases. This demonstrates that the Lenape and the Jerseys were culturally distinct prior to 1760 and appear to have remained distinct throughout the historic period.

About 1730, when some of the Jerseys, including the famous Teedyuscung (Becker 1992a, Ms. B; Wallace 1949) moved into the region of The Forks, the people who lived downriver from them (the Lenape) geographically became the "Unami" (translated as "down river people"). Teedyuscung, who came from the Toms River drainage of the Atlantic shore region of southern New Jersey, and his kin clearly were the "Unalachtigo" in an historic sense: people who came from the ocean side. These

Table 1. The Delawarean Peoples about 1600-1650 A.D.

Map Code Group (or Bands) c. 1600-1650*	Subsistence System	Population Estimate**'
1 Wappinger	Foraging	400
2 Siwanoy (and Kichtawanks, Sinsinks, Wiechquaeskecks, and Rechgawawanks)	Foraging	300
3 Canarsee" (and Nayack, Marechkawieck, and Manhattan)	Foraging	300
4 Matinecock, Rockaway and Massapequa	Foraging	300
5 Catskill (Mahican related?)	Foraging	250
6 Esopus (their range is now being studied)	Foraging	300
7 Munsee	Horticultural(?)	600-800
8 Haverstraw, Tappan and Hackensack, also Raritans? (pre-1640), and Navasinks?	Foraging	500
9 Jerseys (possibly not a single Cultural unit)	Foraging? Horticultural?	400-600
10 Lenape	Foraging	250-400
11 Ciconicin	Horticultural	500
TOTAL (Range)		4,100-4,650

(Sources: Becker 19R3b, 1989, Ms. B; Bolton 1920; Ceci 1977; Goddard 1978; Grumet 1979; Frederick A. Winter [personal communication])

The greatest number of Native American peoples linguistically or otherwise identified as Delaware include people from the Hudson River valley and western Long Island all the way south to include the northern half of the state of Delaware. The above groupings (after Goddard 1978, Becker 1989) are suggested for these peoples. A more detailed delineation or combination of these groups will require extensive and detailed study through methods similar to those applied to the Lenape and their immediate neighbors.

*The territorial extent of these northern groups appears smaller than those of the Lenape or Jerseys. Quite probably many of the groups identified here were only local bands within larger sociopolitical aggregates, whose dynamics remain to be determined. The population estimates in this table can only be considered as maximum possible numbers.

**Goddard (1978:214, Table 1) estimates that in 1600 A.C. the Population of Munsee speakers (exclusive of Long Island) was 4500, while Unami speakers numbered 6400. No specific areas nor cultures are cited.

cultural boundaries persisted long after the Lenape, Jerseys, and Munsee had left their original territories, but identifying terminology changed to reflect geographical relocations just as band names had changed in previous years when each took up residence in a different location. The evidence to demonstrate the persistence of these cultural continuities, long after these people had left this region, is slowly emerging. Heckewelder's statement (1876:51-2) that the "clans of the Delaware" reflect three distinct cultures as they existed in their ancient homelands now may be seen as an accurate observation.



Figure 1 Some of the major Algonkian-speaking groups sometimes identified as "Delawarean," c. 1650. 1) Wappinger; 2) Siwanoy and Rechgawawanks; 3) Canarsee; 4) Matinecock; 5) Catskill; 6) Esopus (probably the Esopus had been located near the Catskill before the Esopus wars of the 1660s); 7) Munsee; 8) Hockensack and Tappan; 9) Jersey (only up as far as the Raritan River, where the Raritans were located); 10) Lenape; 11) Ciconicin.

The territorial extent of these northern groups appears smaller than those of either the Lenape or the Jersey. Quite possibly some of the groups identified here may have been local bands within larger sociopolitical aggregates, or more likely their territories extended further from the river than is clear at present. The population estimates in the table can only be considered as maximum possible numbers. (Goddard (1978:214, table 1) estimates that in 1600 A.C. the population of Munsee speakers (exclusive of Long Island, he notes) was 4500, while Unami Lenape speakers numbered 6,400. No specific areas nor cultural borders, are cited, nor is any attempt made to explain the origins of such numbers.

The Lenape: Archaeological and Historical Populations

A specialized program of research provided the basis for understanding Lenape sociopolitical organization at contact and how these people adjusted to European immigration between 1620 and 1740 A.C. This program, focusing on original documents relating to the Indians of the Delaware Valley, provides the principal source of information for Lenape population estimates (Becker 1986a, b, 1988a). Important in this regard is De Vries' 1633 observation (in Myers 1912:18), referent to the Lenape, that "they dwelt in no fixed place" (in December, or during the winter). Penn's account (in Myers 1912:36) noted that "Every King [elder speaking for the band] hath his Council, and that consists of all the Old and Wise men of his Nation, which perhaps is two hundred People." This number may be Penn's estimate of all the adult males of the Lenape, which would provide a maximum population of about 800 people.

The second source, providing complementary information, derives from the excavation of a Lenape site dating from the early eighteenth century (36CH60). This second source was supplemented by extensive surface survey of other historically documented Lenape summer stations plus the excavation of sites dating to the Terminal Woodland (c. 1500-1600 A.C.) and Early Historic periods (c. 1600-1740 A.C.) throughout southeastern Pennsylvania and northern Delaware (Custer 1986a, b). The conjoined evidence is conclusive, revealing not only a foraging settlement pattern prior to contact, but also that the conservative members of the culture continued this lifestyle well into the nineteenth century (Becker 1986b; cf. Becker 1990). Evidence for this foraging pattern comes not only from De Vries (see above) but also from Penn's statement that "the woods and streams are their larder."

The excavation of a burial area (36CH60) related to an early eighteenth-century Lenape summer station revealed 22 graves (Becker 1992b). Since the site is believed to have been occupied for a total of about 13 years (c. 1720-1733), an annual mortality rate of 5% would mean that the total band size would have been about 33. A high mortality rate is reflected by the normally large number of infant graves.⁴

⁴ The belief that birthrates are very low among foragers supposes that survival rates are unusually high (low infant mortality). A recent study by Early (1985) examined the methodologies of anthropologists who have published relevant data. Early suggests that birthrates of these foraging societies are directly proportional to the length of time which the ethnographer spends in the field (Early 1985). Those ethnographers who are in the field for an extended period record a greater number of births, which may be more representative of foraging reproductive patterns. The correlate, by extrapolation is that forager birthrates are higher than generally believed, as are infant mortality rates. Following Early, I have used a high mortality rate in computing these figures.

The important suggestion that high infant mortality at the Montgomery Site may relate to a major smallpox epidemic which passed through the Philadelphia area in 1731 (Susan Klepp, personal communication 1988) is not supported by the archaeological evidence. The pattern of burials clearly reflects random deaths among all ages over the thirteen or so years of the occupation of the site, and not a clustering of children's graves in any short period of time.

The absolute number in this band is consistent with the expected size of a foraging group (Jochim 1976). Furthermore, historical documents relating to these people (now identified as the Brandywine band) suggest that it was one of the larger Lenape bands. This would be expected since the Brandywine valley area is one of the larger drainages in the Lenape territory.

Since the average size of these foraging bands must have been not more than 25 to 30 individuals (see also Becker 1986c; also Olmstead 1991), the estimate of total Lenape population at any given point in time—either before or after contact—depends on the maximum number of such bands which could have existed at any one time. The total population, however, is unlikely to have been greater than 500 (cf. Birdsell 1968; Binford et al. 1968).

Howell (1979) discusses a model for population studies of foragers (see also Cohen et al. 1980), and discusses various mechanisms for maintaining population stability⁵ (see also Thornton and Marsh-Thornton 1991, and Thornton et al. 1991). The maximum number of bands of the true Lenape in southeastern Pennsylvania and northern Delaware may have been fewer than 12 and can never have been greater than 14 or 15. This is the maximum number of feeder streams into the Delaware River in Lenape territory along which individual bands were foraging. This would place the maximum possible Lenape population at about 450 individuals, with a figure of about 400 more likely to have been a realistic upper limit (cf. Hassan 1981). A slight population increase during the period 1640-1660 may have been generated through the use of Swedish colonial food stores as emergency supplies, and by the 1660s out migration and out-marriage may have increased Lenape population dramatically (cf. Thornton and Marsh-Thornton 1991).

Seventeenth-century manuscripts provide information on every aspect of Lenape life, but most significant for population research are the deeds documenting Lenape land sales to Dutch, Swedes, and ultimately to William Penn (Becker 1984b). The numbers of signatories (grantors) and the pattern by which these people signed these land transfers and other documents suggest that all adult males in each band generally put their marks on these instruments. Furthermore, names almost always appear in the order of birth, with the elder males at the top of these lists and the younger at the bottom (Becker 1989:113n,1, 114n.2). The names of Lenape women rarely appear in any of the documents. When series of documents bearing the name of the same individual are compared, the signature of this person can be seen to "move up" through time (Becker 1989:114). These patterns clearly reflect egalitarian land use by foraging bands (Becker 1993) in which status is based primarily on age and gender (cf. Becker 1983b).

⁵ Cohen *et al.* (1980) provide a number of useful papers relating to biosocial mechanisms involved in population regulation, about half being based on human groups. Cristian's paper, although focused on voles, discusses endocrine and neurological links with population densities, and of particular note are psychogenic stress and reproductive performance.

Outmigration and other factors control population density when space exists. Grumet (1990) recognizes this among the Munsee, but concludes with the ever popular and rather simplistic notion that disease reduced the aboriginal Munsee population.

This Lenape population estimate for the period of contact (Table 1) applies only to those people now identified as members of this specific culture (see Figure 1). The total population here estimated for all Delawarean peoples, based on projections for each of these foraging and horticultural groups, is less than half of the figures which previously appeared in the literature (e.g., Mooney 1911, 1928; see also Goddard 1978:Table 1). A primary reason for this difference may be that these population estimates assumed that these diverse peoples (cultures) termed Delaware (cf. Goddard 1978: Figures 1 and 2) were all horticulturalists at contact.

The Massapequa and Others

The many peoples of the lower Hudson River valley, Long Island, and northern New Jersey who often have been identified as bands of a Delaware Nation are now recognized as having their own distinct identities and culture histories. Detailed studies of each of these nations (e.g. Becker 1991) are needed to see how they related to their native neighbors and also to the various colonial powers that came into this region. Detailed and laborious culling of the documents and the identification of named individuals will allow these nations to emerge as separate peoples from the historical record.

Far from having been displaced by colonials or destroyed by disease, people such as the Massapequa can be seen to have used their skills and abilities to maneuver through a complex period of history to hold on to what little they could secure from a rapidly changing world. As late as 1681, Tackapowsha, representing himself and his "Marshaspeag" associates, went to court to defend their claim to the east side of Cow Neck on the north shore of Long Island (New York Historical Society 1913:32-33). Their court-appointed lawyer successfully pleaded their case. This bit of information, together with hundreds of other pieces of a complex puzzle from which most of the pieces have long been lost, can at least provide a general view of this particular nation (Figure 1). Each of these many native cultures will require years of research to reassemble their individual, and often tragic, histories.

Of importance in each of these studies is the determination of the subsistence system in use at the time of contact. The recent controversy in hunter-gatherer studies (Lee 1992) at least provides us with a clearer understanding of how flexible foraging societies can be and how quickly they can adapt to changing circumstances. Thus the early period of contact in this region, c. 1600-1625, saw some rapid and complex responses on the part of these native peoples. A review of this subject as it applies to the Lenape, as only one of these many groups, may be useful in recognizing the multiplicity of reactions generated by the coming of the various European traders and colonists.

Economic Systems and Population Estimates

Until recently many commentators have described the Delaware in terms of Five Nation (Iroquois) socioeconomic structure (matrilineal horticulturalists) and residence patterns (long

houses clustered in villages). In the absence of direct evidence these ideas continued largely unchallenged. Newcomb (1956:10) reviewed the confusing literature but joined Wallace (1947:9-10) in concluding that the aboriginal Lenape were agriculturalists. Only Kroeber (1947:48) recognized that the Lenape were not food producers at contact.

Recent studies of the Native American populations in the northeastern region of North America, immediately north of the Chesapeake Bay chiefdoms, demonstrate that at the time of European contact only some of these people, such as the Munsee (Kraft 1978), were horticulturalists: food producing peoples using simple tools to cultivate small gardens and using simple storage techniques. Even the horticulturally based Cultures of this region (which appear to be located to the interior, distant from abundant coastal resources) now appear to have had smaller populations than previously believed (see Engelbrecht 1987). The coastal and riverine peoples, such as the Lenape, all appear to have been foragers (Becker 1986c, 1988b), both before and after European contact. Many of the Lenape bands may have grown some maize during their summer encampments, but none of it appears to have been stored for year long use. The view that the Lenape were agriculturalists living in settled villages appears to have derived from a failure to understand the limited nature of Lenape gardening activities, or by inference from data on the Five Nations and others.

My initial research with the Lenape employed the agricultural model; a model developed by historians in the late nineteenth century based on assumptions rather than any direct documentary evidence. After my years of fruitless archaeological survey searching for Lenape villages, plus excavations at several Lenape sites (see also Custer 1986b), followed by the intensive study of land transfers and other documents, I finally concluded that Barnes (1968) was correct in concluding that the Lenape must have been foragers living in small bands (Becker 1984a, 1986b, 1988b, Ms. A) and not the agriculturalists generally depicted in the popular literature.

Most of the evidence for Lenape agriculture derives from historic accounts concerning the limited maize gardening which took place at their summer encampments and the episode of "cash cropping corn" (see Becker 1994, and see below) frequently cited. Some anthropologists and some historians believe that the planting of maize indicates sedentism and agriculture, rather than simple maize gardening by foragers who were supplementing gathered foods with limited summer-grown plants. The fact that storage is entirely absent from both the historic accounts and the archaeological evidence in the lower Delaware Valley indicates that maize was, at best, a food supplement produced in gardens and never intended as a staple.⁶

Confusion regarding the extent of Lenape gardening also is generated from data from an interesting period in Lenape culture history. Invariably the single piece of evidence cited for Lenape agriculture is the 1654-1656 account by Per Lindstrom (1925:223) which describes an unusual and short-term variation in Lenape maize production-the cash cropping of corn for sale to the Swedish colonists. Goddard (1978) perceptively notes the unusual aggregation of Lenape bands from about 1640 to c. 1660,

an interval during which several Lenape bands were cash cropping maize from an unusually clustered series of summer stations (Becker 1994). This activity was an ingenious economic response made by the Lenape, who during those decades had only minimal participation in the fur trade. The Swedish colonists had found that it was cheaper to buy maize from the natives than to grow it themselves. The colonists then focused their farming on tobacco, an extremely rich export crop. When colonial grain production became larger by 1660, the market for Lenape grown maize disappeared. At no time during this episode did the Lenape themselves directly store maize, nor did they alter their normal foraging strategies.

Lenape Band Organization: Summarizing the Evidence for Foraging

The ethnographic data drawn from colonial sources, particularly regarding evidence for the cash cropping of maize, clearly reveal the complexity of Lenape foraging activities. Land sales records provide critical information not only about the size of each parcel sold to the colonials, reflecting not only the territorial range of the grantors, but also the size of each band and the egalitarian nature of Lenape society as noted above.

The archaeological evidence includes data from a Lenape cemetery in use c. 1720-1733, which provides a picture of these people complementary to that derived from the documentary sources. Survey work has revealed numerous foraging encampments, but nothing that resembles the settlements of horticulturalists. These data indicate that population densities were low among the Lenape as well as among their foraging neighbors and may have been nearly as low among the few horticulturalists in this region.

The data from the documents also enable us to generate individual genealogies, to reconstruct family groups, and ultimately to recognize the nature and the boundaries of the social units herein termed "cultures." This research forms the basis for understanding these people during the Late Woodland Period and also provides a foundation for the study of continuities in the centuries after contact. The evidence now being produced both refines and amplifies what we know about the Lenape and their neighbors. The arduous path which we have taken into the past is long, but not so long as that which the Lenape have already traveled.

This research offers no support to theories of decimation through disease, nor is there evidence that alcohol abuse in any way prevented these people from adapting to the changing

⁶ Excavations at the Stahler Site (36LH15) on the south slope of South Mountain, 3 km (2 miles) south of Allentown, Pennsylvania, have revealed a series of shallow pits which may have been used for storage. Numerous seeds of edible plants abundant in this area were identified in these pits, which are dated by "C to 1550 ± 70 A.C. (Beta-2 1245), but no maize is present (David Anthony, personal communication; see also Smith 1989).

economic and political situations generated by European colonization (Becker 1985). Findings from the lower Delaware valley are similar to those described by Ceci for coastal New York (Ceci 1977: Figure 1, Nos. 3 and 4). The interplay between colonists and the Lenape and other foraging natives, may have enabled the latter to increase in numbers in addition to encouraging larger summer aggregations. Lenape cash cropping of maize for sale to Europeans is paralleled by wampum production in the Long Island area and other economic responses made by northeastern foragers. In these cases the densities of summer aggregations appear to have grown, and the overall population may have increased by using colonial food storage systems as a supplement to winter foraging strategies.⁷

By 1660, changes in colonial economics had led tile Lenape to abandon maize production and to shift to fur trading in concert with their former enemies, the Susquehannock. At that time the wars between the Susquehannock and the Seneca, and others of the Five Nations, were entering their final phase, ending in the complete dispersal of the Susquehannock during the winter of 1674/1675 (Jennings 1968; Kent 1984). These events opened the entire center of Pennsylvania and beyond, and the fur trade which went with it, to the Lenape, who gradually began their expansion to the west. The Lenape provide an extremely good example of a culture which used various strategies to meet the challenges of economic and political change in the post-contact period. The Lenape not only survived, but were able to maintain their cultural traditions well into the twentieth century when they began to merge into the American mainstream.

Conclusions

1. The total number of Lenape bands at any given time was approximately 12 to 14, each including about 12 to 40 members.

2. The total population of Lenape foragers was only approximately 250-400, and the archaeological evidence suggests similar populations for each of the separately identified native nations in this region.

3. The riverine and coastal oriented peoples of the northeast were foragers, strongly focused on anadromous fish and other aquatic and river shore related resources. The interior peoples, such as the Five Nations and pre-Contact Susquehannock, lacking such reliable foods, developed horticultural food production systems in order to stabilize resources. These relatively sedentary horticultural systems, which also provided the basis for population expansions [but within limits (see Engelbrecht 1987)], have erroneously been accepted as the uniform model for the entire northeast, a view now being corrected.

⁷ The epidemics reported from the Maine coast in the early 1600s may have been fostered by conditions within summer stations which had become unusually densely inhabited. The depopulation of the area may simply have been a return of the survivors to traditional dispersed foraging strategies.

4. The total population for the linguistically related Delawarean people never exceeded 5,000 before contact, and it appears to have suffered no significant long-term effects from European disease.

Acknowledgments

My sincere thanks are due Dr. Douglas Ubelaker and Dr. John Verano for their interest in and encouragement of this aspect of Lenape research and for their help in formulating the ideas presented herein. Thanks also are due Professor Susan Klepp as well as P. Scheifele for their careful reading of earlier drafts of this text and providing several useful suggestions and corrections. Professor F.A. Winter's data from the New York area, and specifically on the Canarsee, are very much appreciated, as are A.F.C. Wallace's comments on matters relating to Teedyuscung. Any errors of fact or interpretation remain the responsibility of the author alone.

Earlier versions of this paper were presented at the Conference on North Atlantic Environmental Archaeology at Hunter College (14 April 1991) and at the session "Archaeology of the Contact Period in the Northeast" at the Northeastern Anthropological Association Meetings (12 March 1992).

Funding for this research has been provided by grants from The National Endowment for the Humanities, The American Philosophical Society, and from the office of Dean Richard Wells (Arts and Sciences, West Chester University of Pennsylvania).

References Cited

- Barnes, Carol
1968 Subsistence and Social Organization of the Delaware Indians: 1600 A.D. *Bulletin of the Philadelphia Anthropological Society* XX (1):15-29.
- Becker, Marshall Joseph
1983a The Boundary Between the Lenape and the Munsee: The Forks of Delaware as a Buffer Zone. *Man in the Northeast* 26 (Fall): 1-20.
1983b The Ciconicin and the Lenape: Preliminary Evidence for Cultural Distinctions between a Chiefdom and a Foraging Society. *Proceedings of the Laurier- II Conference* (1983). London, Ontario, Canada.
1984a The Lenape Bands Prior to 1740: The Identification of Boundaries and Processes of Change Leading to the Formation of the "Delawares." In *The Lenape Indian: A Symposium*, edited by H.C. Kraft, pp. 19-32. Archaeological Research Center, Seton Hall University. Publication No. 7.
1984b Lenape Land Sales, Treaties, and Wampum Belts. *Pennsylvania Magazine of History and Biography* 108:351-356.

- 1985 Lenape Mortuary Programs as an Indication of Cultural Stability in the Contact Period. Paper presented to the Philadelphia Anthropological Society (15 November 1985). Philadelphia, Pennsylvania.
- 1986a The Okehocking Band of Lenape as an Example of One Mode of Adjustment to Colonial Expansion: Cultural Continuities and Accommodations in Southeastern Pennsylvania. In *Strategies for Survival*, edited by Frank W. Porter III, pp. 43-83. Greenwood Press, Westport, Connecticut.
- 1986b Cultural Diversity in the Lower Delaware River Valley: An Ethnohistorical Perspective. In *Late Woodland Socio-Cultural Evolution in the Middle Atlantic*, edited by Jay Custer, pp. 90-101. University of Delaware Press, Newark.
- 1986c The European Contact/Historic Period in the Lenape Realm of Pennsylvania's Piedmont and Coastal Plain. In *A Comprehensive State Plan for the Conservation of Archaeological Resources*, Volume II, prepared by Paul Raber, pp. 41-51. Pennsylvania Historical and Museum Commission, Harrisburg.
- 1987 The Moravian Mission in the Forks of Delaware: Reconstructing the Migration and Settlement Patterns of the Jersey Lenape during the Eighteenth Century through Documents in the Moravian Archives. *Unitas Fratrum* 21/22:83-172.
- 1988a Native Settlements in the Forks of Delaware. Pennsylvania in the 18th Century: Archaeological Implications. *Pennsylvania Archaeologist* 58(1):43-60.
- 1988b A Summary of Lenape Socio-Political Organization and Settlement Pattern at the time of European Contact: The Evidence for Foraging Bands. *Journal of Middle Atlantic Archaeology* 4:79-83.
- 1989 Lenape Population at the Time of European Contact: Estimating Native Numbers in the Lower Delaware Valley. *Proceedings of the American Philosophical Society* 133 (2):112-122.
- 1990 Hannah Freeman: An Eighteenth Century Lenape Living and Working Among Colonial Farmers. *Pennsylvania Magazine of History and Biography* 114 (2):249-269.
- 1991 The Pompton of Northern New Jersey and Their Origins in Connecticut: Native Migrations in the 17th Century as Evidence for Their Systems of Land Tenure. Paper presented at the 6th Joint Archaeological Conference of the North Jersey Highlands Historical Society and the Archaeological Society of New Jersey. 19 October 1991.
- 1992a Teedyuscung's Youth and Hereditary Land Rights in New Jersey: The Identification of the Unalachtigo. *Bulletin of the Archaeological Society of New Jersey* 47:37-60.
- 1992b The Lenape of the Historic Contact Period. In *The Buried Past: An Archaeological History of Philadelphia*, edited by John L. Cotter, Daniel G. Roberts and M. Parrington, pp. 17-29. The University of Pennsylvania Press, Philadelphia.
- 1993 Lenape Shelters: Possible Examples from the Contact Period. *Pennsylvania Archaeologist* 63(2) (in press).
- 1994 Lenape Maize Sales to the Swedish Colonists. In *New Sweden in America*, edited by Carol Hoffecker. University of Delaware Press, Newark, (in press).
- Ms. A The Brandywine Band of Lenape: Culture Change and Movements as Indicated by Their Encampments during the Seventeenth and Early Eighteenth Centuries. Manuscript on file, Anthropology Section, West Chester University.
- Ms. B Teedyuscung and His Kin: Reconstruction of the Relationships of a Family of Jersey Indians Known from Colonial Documents. Manuscript on file, Anthropology Section, West Chester University.
- Binford, L., J.B. Birdsell, *et al.*
- 1968 The Magic Numbers "25" and "500": Determinants of Group Size in Modern and Pleistocene Hunters. In *Man the Hunter*, edited by R.B. Lee and I. DeVore, pp. 245-248. Aldine, Chicago.
- Birdsell, Joseph B.
- 1968 Some Predictions for the Pleistocene Based on Equilibrium Systems among Recent Hunter-Gatherers. In *Man the Hunter*. edited by R. B. Lee and I. DeVore, pp. 229-240. Aldine. Chicago.
- Bolton, Reginald Pelham
- 1987 *New York City in Indian Possession*. Indian Notes and Monographs II(7). Museum of the American Indian Heye Foundation, New York.
- Ceci, Lynn
- 1977 *The Effect of European Contact and Trade on the Settlement Pattern of Indians in Coastal New York, 1524-1665. The Archaeological and Documentary Evidence*. University Microfilms. Ann Arbor.

- Cohen, M.N., R.S. Malpass, and H.G. Klein (editors)
1980 *Biosocial Mechanisms of Population Regulation*. Yale University Press, New Haven.
- Custer, Jay F.
1986a Introduction. In *Late Woodland Cultures of the Middle Atlantic Region*, edited by J. F. Custer, pp. 1-15. University of Delaware Press, Newark.
1986b Late Woodland Cultural Diversity in the Middle Atlantic: An Evolutionary Perspective. In *Late Woodland Cultures of the Middle Atlantic Region*, edited by J. F. Custer, pp. 143-168. The University of Delaware Press, Newark.
- Early, John D.
1985 Low Forager Fertility: Demographic Characteristic or Methodological Artifact. *Human Biology* 57:387-399.
- Engelbrecht, William
1987 Factors Maintaining Low Population Density Among the Prehistoric New York Iroquois. *American Antiquity* 52:13-27.
- Goddard, Ives
1978 Delaware. In *Handbook of North American Indians*, Volume 15: Northeast, edited by Bruce G. Trigger, pp. 213-239. Smithsonian Institution: Washington, D.C.
- Grumet, Robert S.
1979 "We Are Not So Great Fools." *Changes in Upper Delawarean Socio-Political Life 1630-1758*. University Microfilms, Inc. Ann Arbor.
1990 A New Ethnohistorical Model for North American Indian Demography. *North American Archaeologist* 11:29-41.
- Harris, Marvin
1979 *Cultural Materialism.- The Struggle for a Science of Culture*. Random House, New York.
- Hassan, Fekri A.
1981 *Demographic Archaeology*. Academic Press, New York.
- Heckewelder, John G.E.
1876 History, Manners, and Customs of the Indian Nations Who Once Inhabited Pennsylvania and the Neighboring States [1818]. Revised edition. *Memoirs of the Pennsylvania Historical Society* 12. Philadelphia.
- Howell, Nancy
1979 *Demography of the Dobe !Kung*. Academic Press, New York.
- Jennings, Francis P.
1968 Glory, Death, and Transfiguration: The Susquehannock Indians in the Seventeenth Century. *Proceedings of the American Philosophical Society* 112 (1):15-53.
- Jochim, Michael A.
1976 *Hunter-gatherer Subsistence and Settlement: A Predictive Model*. Academic Press, New York.
- Kent, Barry C.
1984 *Susquehanna's Indians*. Anthropological Series, No. 6. Commonwealth of Pennsylvania, Historical and Museum Commission, Harrisburg.
- Kinsey, Fred
1975 Faucett and Byram Sites: Chronology and Settlement in the Delaware Valley. *Pennsylvania Archaeologist* 45(1-2):1-103.
- Kraft, Herbert C.
1978 *The Minisink Site: A Reevaluation of a Late Prehistoric and Early Historic Contact Site in Sussex County, New Jersey*. Archaeological Resource Center, Seton Hall University Museum, South Orange, New Jersey.
- Kroeber, A. L.
1947 *Cultural and Natural Areas of Native North America*. University of California Press, Berkeley.
- Lee, Richard B.
1992 Art, Science, or Politics? The Crisis in Hunter-Gatherer Studies. *American Anthropologist* 94:31-54.
- Lindstrom, P.
1925 *Geographia Americae with an Account of the Delaware Indians ... 1654-1656*. Translated by Amandus Johnson. The Swedish Colonial Society, Philadelphia.
- Mooney, James
1911 The Passing of the Delaware Nation. *Proceedings of the Mississippi Valley Historical Association for the Year 1909-1910*, Volume 3:329-340. Cedar Rapids, Iowa.
1928 The Aboriginal Population of North America North of Mexico. In *Smithsonian Miscellaneous Collections* 80 (7), edited by John R. Swanton. Washington, D.C.

Myers, Albert Cook (editor)

- 1912 *Narratives of Early Pennsylvania, West New Jersey, and Delaware 1630-1707*. Charles Scribner's Sons, New York.

Newcomb, William W. Jr.

- 1956 *The Culture and Acculturation of the Delaware Indians*. Anthropological Papers, Museum of Anthropology, University of Michigan, No. 10. Ann Arbor.

New York Historical Society

- 1913 Proceedings of the General Court of Assizes held in the City of New York Oct. 6, 1680 to Oct. 6, 1682. *Collections of the New York Historical Society for 1912*, pp. 3-38. The John Watts DePeyster Publication Fund Series Vol. 45. The Society, New York.

Olmstead, Earl

- 1991 Blackcoats Among the Delaware: David Zeisberger on the Ohio Frontier. Kent State University Press, Kent.

Smith, Bruce D.

- 1989 Origins of Agriculture in Eastern North America. *Science* 246:1566-1571.

Stanley, J.M.

- 1852 *Portraits of North American Indians*. Smithsonian Institution Miscellaneous Collections II. Collins, Philadelphia.

Thornton, Russell and Joan Marsh-Thornton

- 1991 Estimating Prehistoric American Indian Population Size for United States Area: Implications of the Nineteenth Century Population Decline and Nadir. *American Journal of Physical Anthropology* 55:47-53.

Thornton, Russell, Tim Miller, and Jonathan Warren

- 1991 American Indian Population Recovery following Smallpox Epidemics. *American Anthropologist* 93:28-45.

Wallace, Anthony F.C.

- 1947 Women, Land, and Society: Three Aspects of Aboriginal Delaware Life. *Pennsylvania Archaeologist* 17:1-35.
1949 King of the Delaware: Teedyuscung. University of Pennsylvania Press, Philadelphia.

Weslager, C. A.

- 1954 Robert Evelyn's Indian Tribes and Place Names of New Albion. *Bulletin of the Archaeological Society of New Jersey* 9:1-14.

The Functions of Thermally Altered Stones: A Preliminary Study

Peter Pagoulatos, Cultural Resource Consulting Group, Highland Park, New Jersey

This paper presents an experimental study concerning the functional uses of thermally altered stone, commonly referred to as fire-cracked rock. A series of experiments were conducted, as specific food resources were cooked in hearth areas containing cobbles of granitic origin. These cobble assemblages were then stone-boiled and subsequently analyzed for thermal alteration characteristics such as reddening, cracking, and spalling for comparative purposes. Quantitative analyses were then applied to the data in order to establish whether differential patterns of thermal alteration exist, dependent upon food resource use.

Introduction

The primary purpose of this paper is to present the results of a series of experiments using thermally altered stones from hearth areas to infer cooking activities of specific resources. In this study, the characteristics of thermal alteration (i.e., reddening, cracking, spalling) were assessed through a series of controlled experiments using different food resources: cultigens, wild nuts, shellfish, fish, and game animals. Each food resource was grilled for one hour over heated stones of granitic origin: the resultant thermally altered artifacts were then stone-boiled. Each assemblage of thermally altered stone was then examined under a 10X-30X low-power microscope. Testable hypotheses pertaining to differential patterns of thermal alteration in relation to specific resource use were then developed.

Studies in ethnoarchaeology and experimental archaeology have contributed significantly to archaeological method and theory (Binford 1978; Gould 1980; Hayden 1979; Ingersoll, Yellen, and Macdonald 1977; Keeley 1977, 1980; Semenov 1976). However, the functional uses of thermally altered stone for cooking purposes are still poorly understood (Cavallo 1984; Louis Berger Associates, Inc. 1987). Until recently, the interpretation of cooking-related features such as hearths from prehistoric sites has been largely based upon the recording of spatial dimensions and attributes, soil analysis, recovered organic remains, associated tools, and sometimes on ethnographic analogy. The vast majority of recovered thermally altered artifactual material from hearth areas is frequently recorded, counted, and discarded.

A recent study by Cavallo (1984; Louis Berger Associates, Inc. 1987) at the Abbott Farm National Landmark, Trenton, New Jersey, has provided valuable information on late prehistoric cooking techniques and

resource use in the Middle Delaware Valley. Cavallo noted a variety of feature forms and thermally altered stone concentrations which presented a series of perplexing questions on possible feature functions. Cavallo performed a series of controlled experiments testing the effects of heat on cobbles used for steaming and stone-boiling. These experiments, in conjunction with trace element analysis of faunal remains (Cavallo and Kondrup n.d.), suggest that recovered features from Abbott Farm may represent activities primarily associated with stone-boiling, and that resource processing was focused upon the intensive procurement, processing, and storage of anadromous fish (Cavallo 1984; Louis Berger Associates, Inc. 1987).

With this study in mind, a series of controlled experiments were conducted to assess whether cooking different food resources will produce differential patterns of thermal alteration on stones within hearth areas. It was hoped that specific thermal alteration characteristics of reddening, cracking, and spalling would be observable on stones used to cook different types of food resources due to different types of fats and oils present in specific foods. In turn, the production of specific thermal alteration patterns on stones under experimentally controlled conditions would aid in archaeological interpretation.

Methods

Thermal alteration experiments were confined to fifteen different food resources: corn, squash, beans, walnut, hazelnut, chestnut, clam, oyster, mussels, white-tailed deer, turkey, duck, trout, salmon, and codfish. These food resources were cooked in hearths containing stone cobbles and oak. Subsequently, the heated cobbles were analyzed for thermal alteration characteristics or attributes.

Thermal alteration refers to the heat treatment of stone artifacts and includes reddening, cracking, and spalling (Figure 1). Reddening usually results from controlled heating and is frequently caused by impurities within the heat-treated material. Cracks in the form of thin crack lines within stone, most often result from the sudden exposure to heat or water. Spalling refers to the fragmenting of stone, either from long-term exposure to heat or the sudden exposure to water.

Granitic cobbles were initially collected from Morris County, New Jersey (Figure 2). Cobbles were weighed. Munsell recorded for color (yellowish red 7.5 YR7/6 to strong brown 7.5 YR5/6), and examined for any observable anomalies (e.g., thermal reddening, cracking). Twenty-five cobbles were then



Figure 1. Reddening, cracking, and spalling.

selected for each experiment. A total of 375 granitic cobbles were used for the subsequent experiments.

Cobbles were then placed within brick cooking platforms. Dried oak leaves were first placed below the stones. Stones were then placed in a single layer over the leaves. Then another layer of leaves was placed over the cobbles, followed by a layer of wood, and the materials were ignited. A total of 454 g (1 lb) of oak leaves and 9080g (20 lb) of oak wood was used for each experiment. Each individual food resource was then placed on a metal grill, over the fire and cooked for one hour. Afterwards, the stones were placed in a 2.5-gallon (9.5-liter) container of water and stone-boiled.

Subsequently, all cobbles were examined using a low-power (10-30X) stereoscopic microscope. Reddening was recorded using a Munsell soil book; color changes typically ranged from 2.5 YR4/6 and 4/8 to 5/6 and 5/8. Cracks were measured in millimeters, using a metric ruler and caliper. Spalls were noted, counted, and reconstructed, whenever possible.

Attributes were measured and recorded using a polar coordinate system, similar to an approach used by Tringham et al. (1974) and Odell and Odell-Vereecken (1980) for stone use-wear analysis. This is an eight-part polar coordinate methodology which consists of placing an artifact on a central point from which radiate a number of lines equally spaced apart.

Using this approach, each cobble was placed within this polar coordinate scheme and measured for specific attributes, such as reddening, cracking, and spalling. First, color change was calculated by determining the total surface area reddened. Second, the total number of crack lines were counted. Third, if the cobble spalled during heating, the total number of pieces were counted. These attributes were then recorded and placed on standardized code sheets. Each variable is defined below.

Total no. reddened: The total number of reddened cobbles present within a specific assemblage.



Figure 2. Unaltered granitic stones.

Surface area reddened: The mean percentage of reddened surface area within a specific assemblage. This is determined by calculating the sum total of surface area of reddening within an assemblage and dividing by 25 (the total number of cobbles in each assemblage).

Total no. cracked: The total number of cracked cobbles present within a specific assemblage.

Total no. cracks: The total number of cracks present within a specific assemblage.

Total no. spalled: The total number of spalled cobbles present within a specific assemblage.

Analysis

Once the experiments were completed, artifacts were photographed and analyzed. Subsequently, the data were compared using simple quantitative measures such as the frequencies, percentages, and scatter plots to assess whether patterns exist between assemblages. The experiments were separated into five major groupings, consisting of cultigens (corn, beans, squash), wild nuts (chestnut, hazelnut, walnut), shellfish (clams, oyster, mussels), anadromous fish (salmon, trout, codfish), and game animals (turkey, white-tailed deer, duck). The results from each experiment are presented in Table 1.

Cultigens, Wild Nuts, and Shellfish

The cooking of cultigens, wild nuts, and shellfish resulted in low degrees of thermal alteration in the form of reddening and cracking. Between 12 and 32% of the cobbles were reddened (Figure 3). However, only small amounts of surface area reddened, ranging from 2 to 3%. Few cracked cobbles were identified (12-24%) (Figure 4). The total number of cracks ranged from 3 to 10 per assemblage. No spalling was evident.

Table 1. Thermally Altered Stone and Resource Use.

Variable	Corn	Squash	Bean	Walnut	Hazelnut	Chestnut	Clams	Mussels	Oyster	Trout	Salmon	Codfish	Turkey	Duck	Deer
Resource															
Wt. (g)	650	1362	454	454	454	454	3050	454	454	272	454	454	908	1816	1090
Total cobble wt (g)	6373	5705	7450	6750	6655	6050	6491	6850	9800	8652	6555	7100	6787	7790	7450
No. reddened	3	4	5	7	7	7	5	7	8	17	10	22	10	17	18
Surface area reddened (%)	2	2	2	3	3	3	3	3	3	10	6	14	6	17	12
No. with cracks	5	4	3	6	5	3	6	5	6	10	7	13	6	10	9
Total no. cracks	7	6	8	10	8	3	11	12	10	18	15	20	15	20	18
No. with spalls	0	0	0	0	0	0	0	0	0	0	1	2	1	0	2

Anadromous Fish and Game Animals

The cooking of anadromous fish and game animals resulted in higher degrees of reddening, cracking, and spalling. A higher incidence of reddening occurred, ranging from 40 to 88% (Figure 3). An increased reddening of surface area was evident (6-17%),

when compared to vegetable and shellfish resources. The percentage of cobbles yielding cracks was also higher (24-52%) (Figure 4). The total number of cracks ranged from 15 to 20 per assemblage. Spalls were present in cobble assemblages associated with salmon, codfish, turkey, and white-tailed deer cooking.

Conclusions

The results from this study have provided valuable information on the functional uses of thermally altered stone. The data appear to indicate that there may be a relationship between thermal alteration and the cooking of specific resources. The cooking of anadromous fish and game animal resources gener-

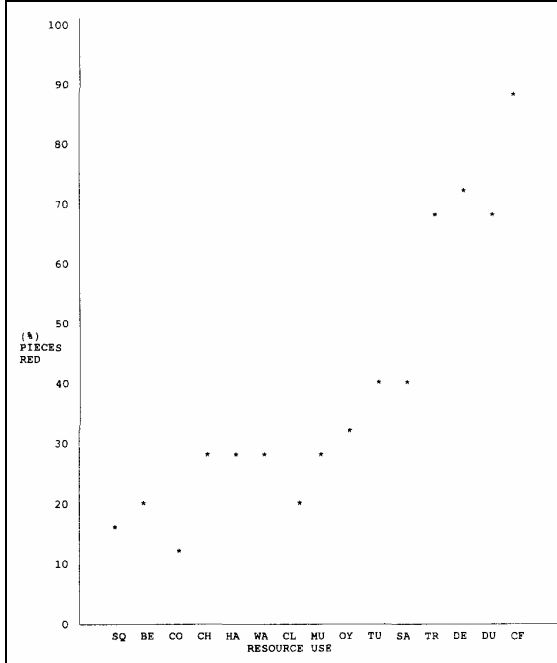


Figure 3. Percentage of reddened pieces and source use.

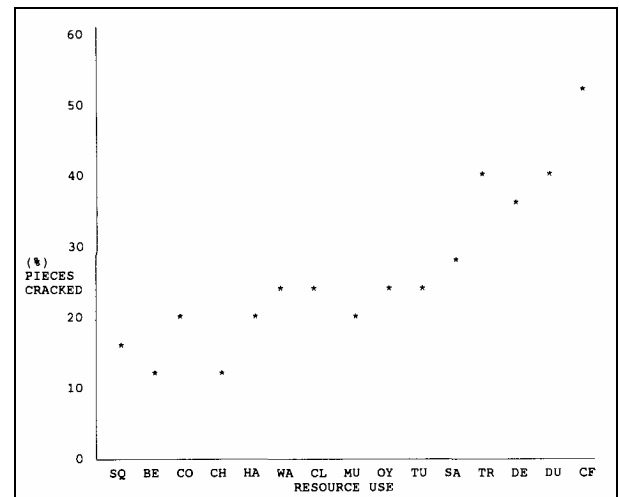


Figure 4. Percentage of cracked pieces and resource use.

SQ: squash	BE: beans	CO: corn	CH: chestnut	HA: hazelnut
WA: walnut	CL: clams	MU: mussels	OY: oyster	TU: turkey
SA: salmon	TR: trout	DE: white-tailed deer	DU: duck	CF: codfish

ally produced higher incidences of reddening, cracking, and spalling. Conversely, the cooking of shellfish and vegetable related items tended to produce less evidence of thermal alteration on stones.

The resulting patterns of thermal alteration identified in this study may ultimately be caused by different types of fats and oils in food items, which intensify and accelerate the cooking process. For example, food resources such as mammals and fish are generally known to possess higher amounts of fats and oils than shellfish and plants (Dunne 1990).

The experimental analysis of thermally altered stone should allow for the development of testable hypotheses that will contribute to the interpretation of the archaeological record. This methodology, in conjunction with other recommended avenues of inquiry, will enable archaeologists to evaluate prehistoric assemblages of thermally altered stone concentrations in a variety of geographic and temporal settings.

Acknowledgments

I wish to thank The Cultural Resource Consulting Group for making this project possible as well as John Cavallo and Charles Bello for their assistance. I would also like to thank George Odell who reviewed an earlier draft of this paper. Any inaccuracies in this paper are the sole responsibility of the author.

References Cited

- Binford, Lewis R.
1978 Nunamiut Ethnoarchaeology. Academic Press, New York.
- Cavallo, John A.
1984 Fish, Fires, and Foresight: Middle Woodland Economic Adaptations in the Abbott Farm National Landmark, Trenton, New Jersey. *North American Archaeologist* 5:111-138.
- Cavallo, John A. and Shari L. Kondrup
n.d. Experimentally-derived Interpretations of Prehistoric Stone Features in the Middle Delaware River Valley. Manuscript in possession of Louis Berger Associates, Inc., The Cultural Resource Group.
- Dunne, L.J.
1990 Nutrition Almanac. Nutrition Search Inc. McGraw-Hill Publishing Company, New York.

- Gould, Richard A.
1980 *Living Archaeology*. Cambridge University Press, Cambridge.
- Hayden, Brian
1979 *Lithic Use-wear Analysis*. Academic Press, New York.
- Ingersoll, Daniel, John E. Yellen, and William Macdonald
1977 *Experimental Archaeology*. Columbia University Press, New York.
- Keeley, Lawrence
1977 The Function of Paleolithic Stone Tools. *Scientific American* 237:108-126.
1980 *Experimental Determination of Stone Tool Use: A Microwear Analysis*. University of Chicago Press, Chicago.
- Louis Berger and Associates, Inc.
1987 Area B (28-Me-1B): Archaeological Data Recovery I-295, and Wetlands Area Interchange. Prepared for the Federal Highway Administration and the New Jersey Department of Transportation Bureau of Environmental Analysis. Prepared by Louis Berger and Associates, Inc., The Cultural Resource Group. Trenton Complex Archaeology: Report 8.
- Odell, George H. and Frieda Odell-Vereecken
1980 Verifying the Reliability of Lithic Usewear Assessments by "Blind-tests:" The Low-Power Approach. *Journal of Field Archaeology* 7:87-120.
- Semenov, S.A.
1976 Prehistoric Technology.- An Experimental Study of the Oldest Tools and Artifacts from Traces of Manufacture and Wear. Translated by M.W. Thompson. Barnes and Noble Books, Totowa, New Jersey.
- Tringham, Ruth, Glenn Cooper, George Odell, Barbara Voytek, and Anne Whitman
1974 Experimentation in the Formation of Edge Damage: A New Approach to Lithic Analysis. *Journal of Field Archaeology* 1: 171-196.

Niagaraware: A Unique Indian Material Culture and Culture Region

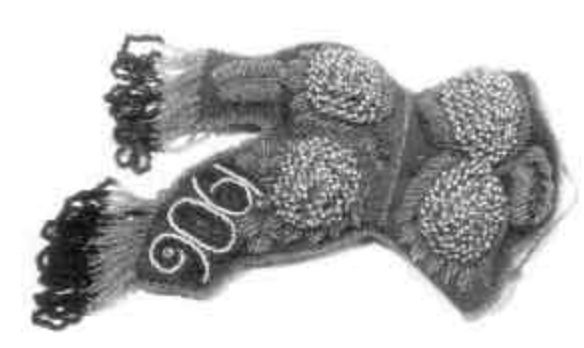
Jeffrey J. Gordon, Department of Geography, Bowling Green State University

The White tourist trade at Niagara Falls stimulated the large-scale sale of Indian beaded souvenirs, a form of acculturation that blended Indian and White traditions. A Niagaraware region was generated from a collection 180 beaded artifacts, some of which had placenames and/or dates. With Niagara Falls a core of high density, this region encompassed Lake Ontario and the St. Lawrence River as far as Montreal having a domain of moderate intensity on the Canadian side and a sphere of low intensity on the United States side. This Indian material culture, according to the greatest number of dated pipes, peaked in popularity during the 1910s.

Beadwork ascribed primarily to the Iroquois Indians has long been produced expressly for the tourist trade, and especially at Niagara Falls, from the mid-nineteenth century continuing to the present. These beaded souvenirs purchased by visitors are known to their collectors today by several vernacular terms including Indian beaded whimsies, knick-knacks, and Niagaraware.

As a geographer I have long been interested in this particular and unusual form of material culture that seems in several ways

to represent both an interface between Canada and the United States and a form of acculturation between Indian and White societies. This Indian beadwork is unique in its construction, form, and function. First, it is readily distinguishable from all other Native American beading techniques due to its having a pronounced raised appearance. This decorative look is created by sewing more strung beads onto a given space than will lie flat (Figure 1a). The result of repeating this procedure over an area is that the topmost beads sometimes lie an inch or more above the material background (Figure 1b). This three-dimensional effect is also achieved by producing groups of bead loops literally tied into decorative knots. Additional Indian hallmarks include the use of floral designs (as contrasted to geometric, for example), usually of leaves. A ubiquitous motif is the dove often perched on or holding a sprig (Figure 2). Other life forms are occasionally used such as the squirrel, beaver, duck, cat, lion, and moth. One



a



b

Figure 1. a. "1906" beaded shoe: b. profile of "1906" beaded shoe.

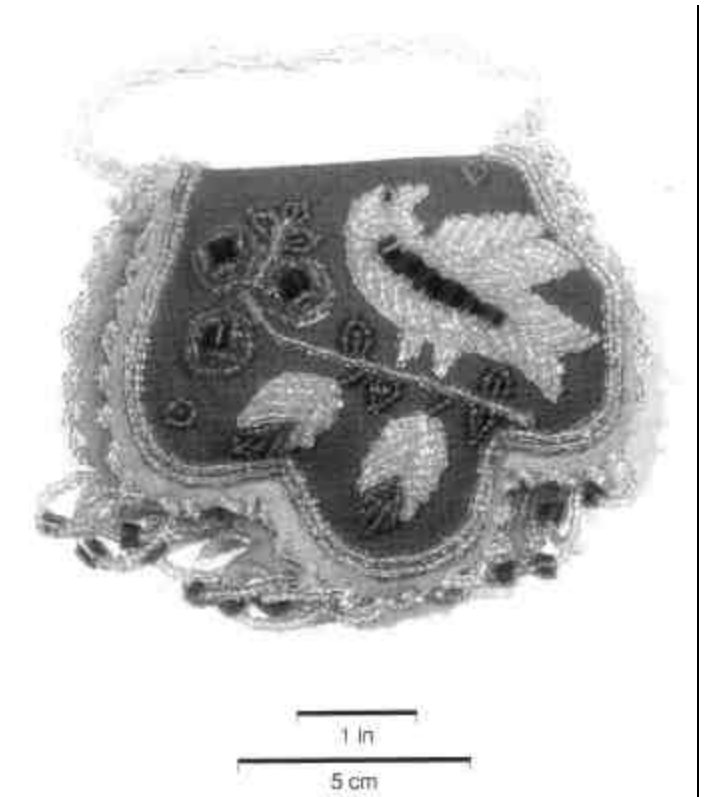


Figure 2. Beaded pin purse (closed).

very common motif is the flag, usually of the United States but sometimes of Britain or France (Figure 3). The use of a velvet background, cambric backing, ribbon edging, paper patterns underneath the beaded designs, and glass seedbeads are also diagnostics of this beadwork.

Second, the beaded artifacts are almost always White objects, especially Victorian, rather than Indian in their form and function. Common types include pin cushions in various shapes such as high button shoes and pillows (Figures 1a, 1b, and 3) pin purses (Figure 2), picture frames, match holders (Figure 4), whiskbroom holders, boxes, wall pockets, canoes, and horseshoes. Thus, those not familiar with this Indian beadwork style might understandably but incorrectly assume such work to be of White origin.

Specifically, I was interested in the spatial and temporal nature of these beaded Indian souvenirs. For example, could a geographic region be delineated within which these souvenirs were sold, and if so would it be contiguous or discontinuous, uniform throughout or reflective of a well-defined core of higher density as the term *Niagaraware* suggests? Historically, did the sale of this beadwork reflect a rather constant or sustained level of popularity through time, or was there a particular heyday as their Victorian nature suggests?



Figure 3. "1927 Columbus (*sic*) Ohio" beaded pin cushion with U.S. flag.

It is curious as well as frustrating to note that *Niagaraware*, probably because it is a form of Indian acculturation rather than a more traditional or purely Indian form, is not often found even in Indian museum collections or the scholarly literature. A collection of 180 pieces of *Niagaraware*, accumulated over 18 years (1974-1992) by the author at flea markets and antique shows in New York and surrounding states, offered a suitable sample from which several data tabulations would be performed and preliminary conclusions offered. Of great help in this historical geography, study was the fortuitous fact that some of these souvenirs actually incorporate in their beading the placename designation where they were sold to tourists (Figures 3, 4, and 5) and/or the year they were made (Figures 1b, 3, 4, and 5). Occasionally this information is also found written on the object by its purchaser.



Figure 4. "1901 Montreal" match holder.

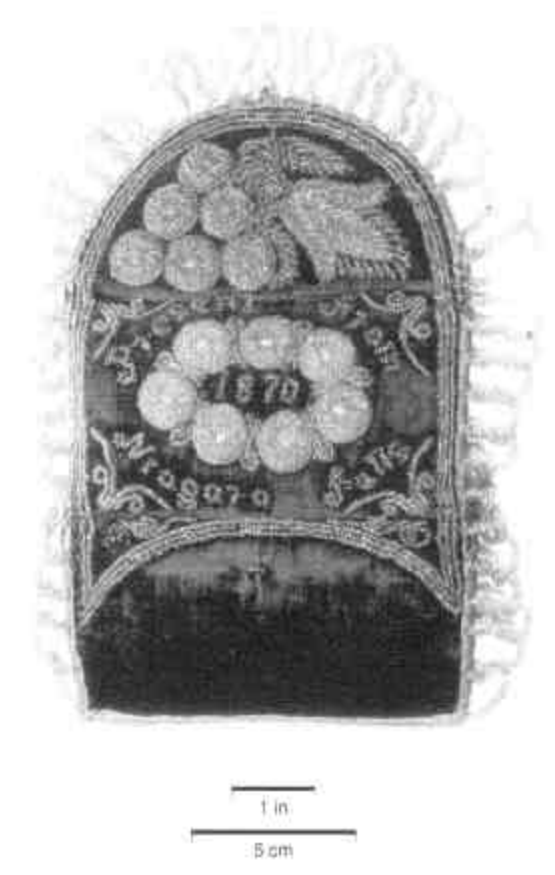


Figure 5. "1870"Viagara Falls" pin purse (open).

Of the 180 beaded items in the collection, the majority of 107 (59.4%) lacked any placename or date information. However, 32 (17.8%) had placenames, and 53 (29.4%) had dates. Tabulation of these data subsets revealed that of the 32 items with placenames (Table 1), 15 were from Niagara Falls (Figure 5), five each were from Toronto and Montreal (Figure 4), and one each were from seven other places: Canada, Caughnawaga, Columbus (Figure 3), Indian Falls, Malone, Saratoga, and Syracuse.

When plotted on a map a relative regionalization of this Indian beadwork is suggested (Figure 6). The large number of Niagara Falls examples, representing almost half (46.9%) of all beaded souvenirs having placenames, appears to form a distinct and dense Canadian/United States border core for this material culture region. Given this, the vernacular label Niagaraware seems to have been an accurate one. Toronto and Montreal also represent multiple examples of placename-labeled items (15.6% each). However, having only one-third the number of occurrences as Niagara Falls examples, their lesser density appears to

Table 1. Locations and Number of Pieces of Niagaraware Having Placenames.

Location	Number of Pieces
Niagara Falls	15
Toronto	5
Montreal	5
Caughnawaga	1
Canada	1
Malone	1
Saratoga	1
Syracuse	1
Indian Falls	1
Columbus	1
Total	32

compose a Canadian domain for this Niagaraware region. The seven other places labeled on these beaded souvenirs, each with only one example (3.1%), appear to constitute a United States sphere or zone characterized by a very low density (Figure 7). Thus, a distinct Niagaraware region that extends from Niagara Falls encompassing Lake Ontario and the St. Lawrence River to Montreal becomes apparent. It is further characterized by having three subregions varying according to density: a Canadian/ United States core centered on Niagara Falls, a Canadian domain extending from Toronto to Montreal, and a United States sphere extending from Caughnawaga (opposite Montreal) to Indian Falls (opposite Niagara Falls) and including Columbus, Ohio as a discontinuous outlier.

It may be significant that the word "fair" follows the cases of Syracuse and Malone, as well as the word "exhibition" following the case of Toronto for both 1922 and 1941. These compound examples may represent special orders of Indian-made souvenirs for sale at specific events, rather than reflecting a location per se. Such modifiers suggest that these locations may not have sustained the perennial tourist trade that was characteristic of Niagara Falls. The case of Columbus (*sic*) Ohio appears to be somewhat of a spatial anomaly as it lacks any neighboring locations (Figures 3 and 6). Other anomalies are that it is both spelled incorrectly and its state designation is included, the only such piece in the entire collection. This curious example suggests that this location (i.e., Columbus) was quite unfamiliar to the Indians.

As this analysis is based upon 180 beadwork examples of which only 32 yielded placenames, from a total of perhaps tens of thousands of these souvenirs that were sold, it is obviously not definitive. However, the complete or total population unfortunately can probably never be fully reconstructed. It seems at this stage at least that the core, domain, and sphere are separate although forming contiguous zones, with the one example of Columbus forming a discontinuous sphere outlier. Even if additional locations are added as a consequence of enlarging this



Figure 6. Map of Niagaraware having placenames. Modified from "Indian Villages c. 1870," in *Atlas of Great Lakes Indian History*, edited by Helen Hornbeck Tanner, University of Oklahoma Press, Norman, 1987, p. 177.



Figure 7. Map of the Niagaraware Region with its core, domain, and sphere subregions. Modified from "Indian Villages c. 1870," in *Atlas of Great Lakes Indian History*, edited by Helen Hornbeck Tanner, University of Oklahoma Press, Norman, 1987, p. 177.

study population, the overall boundaries created by encompassing these three subregions may still prove to be fairly accurate assuming, of course, that this sample population is representative of the original totality.

The temporal range of all the dated beaded souvenirs extends from 1870-1950, a span of 88 years (Table 2). A histogram of these 53 artifacts displaying the nine decades involved does not show a steady state of popularity for this Indian beadwork (Figure 8). Rather, the popularity of Niagaraware grew sharply from a low in the 1870s and 1880s to a zenith in the 1910s, from which it subsequently declined continuously to the 1950s when it reached the same low level characteristic of the 1870s and 1880s. A period of 50-60 years encompassing the decades of the 1890s, and certainly by the 1900s, to the 1940s seems to have been the most popular for the sale of Niagaraware. Thus, the existence of a golden age or heyday for Niagaraware is suggested.

Although only 19 beaded souvenirs incorporate placenames with dates, their temporal range extends throughout the entire 88 years from 1870-1958 (Table 2). Interestingly, both

the earliest dated piece of 1870 (Figure 5) as well as the latest dated piece

Table 2 Dated Niagaraware With and Without Placenames, by Decade.

Decade	With Placename	Without Placename	Total
1870	1	0	1
1880	1	0	1
1890	1	4	5
1900	1	9	10
1910	2	9	11
1920	4	5	9
1930	1	7	8
1940	7	0	7
1950	1	0	1
Total	19	34	53

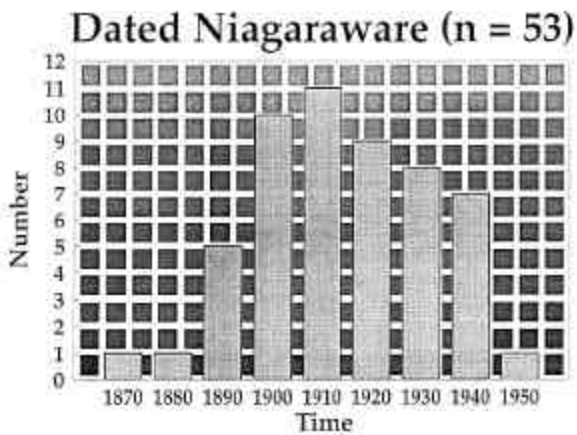


Figure 8. Histogram of dated Niagaraware.

(1958) are from Niagara Falls, as might be expected due to the near majority of beadwork coming from this core. The temporal range of the 34 beaded items without placenames is only 46 years (1891-1937), or about half of the 88 year range for the Niagara Falls pieces. Temporal differences between these two data subsets suggest that Niagara Falls became important as a tourist attraction two decades earlier than other areas and retained its importance and dominance for two decades after other areas had declined.

A study population of more than 180 artifacts would likely extend these dates somewhat revealing that this enterprising phenomenon began prior to 1870 (which is supported by early newspaper accounts) and continued beyond 1958 (which is supported by personal observation). Again, however, if representative of the sum total, the historical pattern displayed by the study population showing the temporal dynamics of Niagaraware with its rise and ebb in popularity may be fairly accurate.

Bibliography

Anonymous

1859 Bead Watch-Case. *Godey's Lady's Book and Magazine* (February). 160.

Anonymous

1877 Scene at Niagara. *Harper's Weekly* (August 18), 646.

Arbeit, Wendy

1982 Beaded Whimsies: Indians Made Clever Objects for Victorian Tastes. *Collections*, Buffalo Museum of Science Magazine 62(2):9-11.

Baker, Stanley L.

1975 Beaded Indian Whimsies. *The Antique Trader* (June 3), 45-46.

1980 Tourist Attractions at the Turn of the Century ...Indian Beaded Whimsies Valued Today. *Collectors News* 21(5):1, 64.

Carlisle, Lillian Baker

1964 Beadwork Whimsies. *The Spinning Wheel* (September), 8-9.

Forsht, Nichol J.

1968 Indian Beadwork in the Souvenir Trade. *Museum Service*, Rochester Museum of Art and Sciences 41:18-19.

Gunther, Erna

1975 The Whimsies. *The Permanent Collection* Vol. I. Whatcom Museum Press, Bellingham.

Hill, Richard

1980 Hodenosaunee Beadwork: Colorful Beads of Glass. *Turtle* (Winter).

Hunt, Norman Bancroft

1991 Native Americans: The *Life and Culture of the North American Indian*. Mallard Press, New York.

Kovel, Ralph and Terry Kovel

1979 *Kovels on Antiques and Collectibles* 5(7):77.

Lyford, Carrie A.

1947 *Iroquois Crafts*. U.S. Department of the Interior Bureau of Indian Affairs.

Mulac, Glenda L.

1988 Collector Preserves Niagara Falls Indian Souvenir Beadwork. *New York-Pennsylvania Collector* (September), 12-13.

Poese, Bill

1972 Indian Beadwork. *The Antiques Journal* (November), 36-38.

1974 Pocketbooks are for Collectors. *The Antique Trader* (October), 52-53.

Sears, John F.

1989 *Sacred Places: American Tourist Attractions in the Nineteenth Century*. Oxford University Press, New York.

Vidler, Virginia

1976 American Indian Antiques: *Arts and Artifacts of the Northeast*. A.S. Barnes & Co., New Jersey.

Whiteford, Andrew Hunter

1970 *North American Indian Arts*. Golden Press, New York.

Book Review

William E. Engelbrecht, Frederick Houghton Chapter, NYSAA

The Massawomeck: Raiders and Traders into the Chesapeake Bay in the Seventeenth Century. James F. Pendergast. Transactions of the American Philosophical Society, Vol. 81 Pt. 2, 1991, vii + 101 pp., index. \$15.00 (paper).

The Massawomeck are one of many early seventeenth century Native American groups about which little is known. Documents record their presence in the Chesapeake Bay region as both raiders and traders, but the location of their homeland is uncertain. Jim Pendergast has painstakingly compiled all known cartographic and primary historic references to this elusive group. He then summarizes and evaluates past scholarly conjectures concerning the Massawomeck and advances some reasonable suggestions based on these data.

Massawomeck was a term used by Chesapeake Bay Algonquians and recorded by the English. French sources refer to a group called the Antouhonoron, and Pendergast suggests that they were the same group. Pendergast further suggests that the Massawomeck/Antouhonoron were located east of the Niagara River before 1622, early references saying that they lived near an inland sea. Sometime after 1622, the sources suggest, they moved to an Appalachian location west of Chesapeake Bay, and Pendergast argues for a location near the headwaters of the Youghiogheny River. Pendergast notes that such a move would have allowed the Massawomeck greater access to European trade material. The Algonquians around Chesapeake Bay said the Massawomeck were a confederacy consisting of some 30 towns and that in 1632 they lived three days' journey from the Hereckeene (Erie).

This monograph is an exhaustive treatment of what is known and has been said about the Massawomeck, and as such it is a tour de force. However, to paraphrase Peter Reid (1991:15) "Why bother about an obscure early historic people?" The answer on which I think Peter Reid, Jim Pendergast, and I would all agree is that the Massawomeck data raise important questions about population distribution and ethnicity, population movement, and trade during the early seventeenth century. In the remainder of this review I would like to touch on some of those questions.

If the Massawomeck/Antouhonoron were located in the Niagara Frontier region, where were the Erie and Wenro located? It has also been suggested that the Akhrakvaetonon, Neutral, and Kahlwa were located in this same area. Balanced against these conflicting suggestions is the fact that there are relatively few Iroquoian village sites with trade material in this same region. An early seventeenth-century village along the Cattaraugus, two villages immediately south of Buffalo, and possibly one in Niagara County do not add up to the 30 villages mentioned for the Massawomeck, nor can they accommodate more than two or three named groups. This lack of concordance between archaeological and ethnohistoric data raises questions both about the completeness of the archaeological data base and the

likelihood that the Massawomeck were indeed located in this region.

If the Massawomeck numbered some 30 towns, then their movement from one region to another in the 1620s should be observable archaeologically. Jim Pendergast invited archaeologists from New York and Pennsylvania to the fall 1991 Conference on Iroquoian Research to consider this possibility. Those present were unable to reconcile the existing ethnohistoric information for the Massawomeck with extant archaeological data. Bill Johnson, who is familiar with material in both western New York and western Pennsylvania, did not see archaeological evidence for a massive move from Western New York to Pennsylvania in the early seventeenth century. Johnson does suggest (1992) that some Protohistoric Monongahela groups might have been Massawomeck and observes that the Monongahela culture is dispersed by c. 1635, just at the time that mention of the Massawomeck ceases in historic documents.

Indirectly, this monograph also raises the topic of ethnicity. How distinct were the Massawomeck as a "people?" They were apparently a confederacy. Yet, in the early seventeenth century a number of native groups and confederacies survived by maintaining a flexible sociopolitical organization, with individual groups sometimes involved in shifting alliances. It is therefore possible that the Massawomeck as an entity were a relatively short lived phenomenon, even though component groups may have had a longer existence and a separate identity. Inferring alliances from archaeological data remains problematic.

This monograph brings together more information on the Massawomeck than any of us probably ever knew. At the same time, it reminds us of how much is still not known. This study provides a challenge to archaeologists to further reconcile their data with that from ethnohistory. A fuller understanding of the Massawomeck cannot be divorced from the need for a fuller understanding of the adaptive response of all groups in the Northeast and Mid-Atlantic during the early seventeenth century.

References Cited

- Johnson, William C.
1992 Ontario Iroquoian and Monongahela Culture Contact During the Terminal Late Prehistoric and Protohistoric Periods: The Case for the Massawomeck Connection. Paper presented at the Canadian Archaeological Association Meetings. London, Ontario.
- Reid, Peter
1991 *Review of The Massawomeck: Raiders and Traders into the Chesapeake Bay in the Seventeenth Century.* Arch Notes May/ June: 15-16. Newsletter of the Ontario Archaeological Society.

Comment

Donald A. Rumrill, Van Epps-Hartley Chapter, NYSAA Fellow

This is a response to recently published papers appearing in the NYSAA *Bulletin* No. 103 (1992) and the NYSAA *Chenango Chapter Bulletin* Vol. 24, No. 4 (1991) in which John McCashion made what this writer considers to be conclusions not consistent with present proven analyses regarding seventeenth-century Mohawk Indian chronology and movements. Rather than correct each of these conclusions point by point, this writer directs the reader's attention to the NYSAA *Bulletin* No. 90 (Rumrill 1985) and *Beads* Vol. 3 (Rumrill 1991) in which there are in-depth studies of the seventeenth-century Mohawk Indian chronology and movements using site-by-site artifact assemblages, glass trade bead chronology, and documentary evidence in methodological analyses of the various habitation sites. These judgments are in direct correlation with those for the Oneida (Bennett 1983), the Onondaga (Bradley 1987), the Cayuga (DeOrio 1978), and the Seneca (Wray et al. 1991) for the same chronological period.

Beads Vol. 3 contains an article (Rumrill 1991) in which glass trade beads are presented as a primary diagnostic artifact in dating Mohawk sites by analytical comparison involving 10,000 beads. Approximately 7,500 beads are listed in tables for ten distinct time periods from 33 habitation sites for the benefit of researchers. In addition, Dr. Dean R. Snow, head of the Anthropology Department, SUNY Albany, is at present having Accelerator Mass Spectrometry (AMS) analyses made at the University of Arizona, Tucson, on corn and other samples from seventeenth century Mohawk sites, and of more than 40 results so far, this writer's temporal conclusions and sequences have been "on the mark" (Snow, personal communication 1992).

The Briggs Run Site report in *Beads* (Rumrill 1991), for instance, lists 635 glass trade beads of which 539 are seed beads and not one "pea sized globular opaque brick red colored bead," contrary to McCashion's (1992:7) Hagerty (1985) quote. Seed beads, barrel beads, "gooseberry" beads, etc. are all diagnostic of the first quarter of the seventeenth century, not 1667-1682 as McCashion alleges for the Briggs Run habitation period. The Yates Site, as John states correctly, is the same period as Briggs Run, again following Hagerty; however, Hagerty completely misinterpreted both of these sites and offered dates forty years more recent than the artifact assemblages demanded. This is not surprising since his book also was partially based on the De la Croix map, which had been previously pointed out to him as being fraudulent (Starna 1987). The Briggs Run artifact assemblage has two pieces of a bulbous white-clay smoking pipe which are in the Dorn collection at Salamanca, New York (Snow, personal communication 1992); Yates also has only a few fragments of white-clay smoking pipes (Henry Wemple, personal communication 1982). Neither site has any firearms artifacts, which do not make their appearance until the 1630s (Rumrill 1986), and native-made materials have accounted for

90% of artifacts collected over the years on both sites, common traits throughout New York State Iroquoia for the early seventeenth century.

Incidentally, in October 1992, a new exhibit opened at the New York State Museum in Albany focusing on the Mohawk Valley for the dates 1450-1650 featuring a scale model of the Briggs Run Site. The text and accompanying artifacts for the site are all characteristic of the first quarter of the seventeenth century. McCashion is mistaken as regards the Greenhalgh journey in 1677 through the Mohawk Valley. All the sites are identified by name in NYSAA *Bulletin* No. 90 (Rumrill 1985), except White Orchard (Cnj-3) (IIIIF2 "X"), which the writer chose to protect on the advice of other archaeologists due to the belief that it was still pristine. It has recently lost this quality. Maps of both Briggs Run and White Orchard were drawn by General John S. Clark on October 4, and August 11, 1877, respectively, and copies are fairly common in collectors' libraries.

Contrary to McCashion's statement, my trusted friend, the late Lester Wagar (correct spelling), not discover the Turtle Pond Site. The late John Jackowski informed me of the location, and I, in turn, passed it on to Wagar. The site originally was called the Lone Man (not One House) Site; however, my investigations indicated a habitation area too large for this misnomer, and I re-named it Turtle Pond. The artifact assemblage included a predominance of redwood-colored glass trade beads and several brass religious finger rings indicating a habitation time frame of 1667-1682.

I knew Mr. Jackowski as well as or better than any of his colleagues, and we freely exchanged information. In our many years of close association, he never even once mentioned an "unrecorded" Briggs Run Site.

One of McCashion's concerns about this writer's 1985 NYSAA paper was his assertion of a meeting declaring a moratorium on correcting the Caughnawaga Site temporal span. I have checked with officers and members of the NYSAA Van Epps-Hartley Chapter for the quoted date, March 19, 1972, and none can recall this having occurred. The consensus is that if there was such a meeting, it had to be unofficial as far as the Van Epps-Hartley Chapter was concerned. It certainly was not scheduled or sanctioned. The only conclusion is that a few persons may have agreed to not make public the true dates for the Caughnawaga Site in deference to Grassman (1969) and his quest for a shrine at that location dedicated to the Mohawk Indian maiden, Katerie Tekakwitha. Regardless of the circumstances, this does not justify knowingly publishing incorrect archaeological dates (McCashion 1975, 1977, 1979) (McCashion, personal communication 1984).

The writer and many other persons have had open discussions concerning the dates of the Caughnawaga Site with the

supervising Franciscan Brothers and priests. As for risking eviction from the Mohawk-Caughnawaga Museum as headquarters for Van Epps-Hartley (McCashion 1992:1), the chapter is still there on a very strong and friendly basis eight years after publication of my paper (1985). The only moratorium ever invoked by the Van Epps-Hartley Chapter was, and is, a moratorium on excavation of burials.

John refers to the Fox Farm and Caughnawaga sites as Caughnawaga 1 and 2 which, if he wants to be accurate, should be 2 and 3. If he had referred to NYSAA *Bulletin* No. 90 (Rumrill 1985:25-27), he would have been aware that the Freeman Site, which predated Fox Farm, was the original Caughnawaga (Kagnuwage) as documented in Brodhead (1853 I:659) and continued by Dr. Kingston Larnier with his excavations in 1969-1970.

Table 1 (McCashion 1992:2) dates White Orchard to 1667-1689. Every site for the period 1667-1682 has more than 90% red glass trade beads and many religious items in their artifact assemblages, and those for 1682-1693 have predominantly black beads and no religious items. White Orchard has 96.5% red beads and numerous religious artifacts; Caughnawaga has 88% black beads and no religious artifacts (Rumrill 1991). Therefore, White Orchard has a terminal date of approximately 1682.

It is also difficult to understand why McCashion should dispute this writer's median date of 1688 for Caughnawaga and substitute 1689.5, arrived at via the Binford formula. A few more pieces of white-clay pipes stems from only a couple of more pipes would have skewed his figure by at least that much.

When this writer had completed the essay on the chronology of the seventeenth-century Mohawk (Rumrill 1985:1-39), it was presented to Dr. James Bradley and Dr. Kingston Larnier for review of content and accuracy prior to publication. A request was also made to Dr. Larnier, who is a devout Catholic, a trustee of the Mohawk-Caughnawaga Museum, and a long-time member and officer of Van Epps-Hartley, that he check the script for discretion on my treatment of dating the Caughnawaga Site. There was no objection to the manner in which it was presented.

In this writer's opinion there are numerous inaccurate conclusions in the McCashion articles in the *Chenango Bulletin* 24, No. 4 and NYSAA *Bulletin* No. 103, and they are not reliable sources of information for the chronology and movements of the seventeenth-century Mohawk Indian habitation sites.

References Cited

- Bennett, Monte
1983 Glass Trade Beads from Central New York. In *Proceedings of the 1982 Glass Trade Bead Conference*, edited by Charles F. Hayes III, pp. 51-58, Research Records No. 16. Rochester Museum & Science Center, Rochester, New York.
- Bradley, James W.
1987 *Evolution of the Onondaga Iroquois: Accommodating Change 1500-1655 A.D.* Syracuse University Press, Syracuse.
- Brodhead, John R.
1853-71 *History of the State of New York*. 2 vols. Harper and Brothers, New York.
- DeOrio, Robert N.
1978 A Preliminary Sequence of the Historic Cayuga Nation within the Traditional Area: 1600-1740. *NYSAA Beauchamp Chapter Newsletter* 9(4).
- Grassman, Rev. Thomas
1969 *The Mohawk Indians and Their Valley*. J.S. Lischynsky, Schenectady, New York.
- Hagerty, Gilbert W.
1985 *Wampum, War and Trade Goods West of the Hudson*. Heart-of-the-Lakes Publishing, Interlaken, New York.
- McCashion, John H.
1975 The Clay Tobacco Pipes of New York, Part One. *The Bulletin*, New York State Archaeological Association 65:1-19.
1977 The Clay Tobacco Pipes of New York, Part Two. *The Bulletin*, New York State Archaeological Association 71:2-19.
1979 A Preliminary Chronology and Discussion of Seventeenth and Early Eighteenth Century Clay Tobacco Pipes from New York State. *BAR International Series* 60, Oxford, England.
1991 The Clay Tobacco Pipes of New York State, Part Three. *Chenango Chapter, NYSAA, Bulletin* 24(4).
1992 The Clay Tobacco Pipes of New York State, Part Four. *The Bulletin*, New York State Archaeological Association 103:1-9.
- Rumrill, Donald A.
1985 An Interpretation and Analysis of the Seventeenth Century Mohawk Nation: Its Chronology and Movements. *The Bulletin*, New York State Archaeological Association 90:1-39.
1986 The Evolution of Firearms and Its Relationship to Seventeenth Century Mohawk Chronological Analysis. Paper presented at the NYSAA annual conference, Middletown, New York.
1991 The Mohawk Indian Glass Trade Bead Chronology ca. 1560-1785 A.D. Beads, *The Journal of Bead Researchers* 3:5-45, Gloucester, Ontario, Canada.
- Starna, William A.
1987 *Book Review. Wampum, War and Trade Goods West of the Hudson* by Gilbert Hagerty. 1985. *New York History* 68(3):339-341.
- Wray, Charles F., Martha Sempowski and Lorraine P. Saunders
1991 Two Early Contact Era Seneca Sites. *Tram and Cameron. C.F. Wray Series in Seneca Archaeology Vol. II. Research Records No. 21*. Rochester Museum & Science Center, Rochester, New York.

Minutes of the 76th Annual Meeting New York State Archaeological Association¹

Eddy Ridge Farms, Sparrowbush, New York

Executive and Business Meeting

The meeting was called to order by President Roger H. Moeller on Friday, April 24, 1992. The roll call indicated three Executive members plus (one stand in) and 11 Executive Board members present. This constituted a quorum.

Old Business

Secretary John McCashion was unable to attend because of illness; therefore stand-in Kirsten Brophy read the last Annual Meeting minutes which were supplied by John McCashion. The minutes were then entered into the record.

The Treasurer's Report was given and voted to be accepted as read.

Committee reports were given by the chairpersons present.

A copy of the Legislative Report will be available in the publications room after the General Business Meeting on Saturday morning.

Archaeology Week will be May 10-16, and posters are available for chapters to sell at \$5.00 each. They may be picked up at the registration desk and in the publications room. This will be an annual event in May, and a committee needs to plan for such an event. Awards Chair Peter Pratt reported that the awards have been decided upon and that they will be given out at the Annual Banquet on Saturday night.

President Roger Moeller stated that the chapters should mail memberships on schedule. They are not getting to the appropriate persons in time for *Bulletin* mailings. Also, the NYSAA could save money by combining two bulletins. This would save the association one mailing a year.

There was a discussion about *pro bono* awards. The decision was tabled until more information can be obtained.

The announcement was made of a new chapter having been formed. It was brought forth for a vote of acceptance in the NYSAA. The Adirondack Chapter was then accepted as the fourteenth chapter.

New Business

Proposition One was presented by Secretary John McCashion and read by Acting Secretary Kirsten Brophy. The Secretary mailed Proposition One to the Executive Committee and mailed ballots for a vote on July 6, 1991. Sixty days later, he received 22 ayes, 4 nays, and 4 abstaining votes. He stated in his report that this was legal and binding. After a long and intense discussion on the procedure of Proposition One voted on by the Executive Committee, Proposition One as printed in the *Avocational Newsletter* was called out of order and voted null and void. It was also voted that the next President should appoint a committee to evaluate and review the awards criteria and report back to the President with a copy to be sent to the awards chairperson.

It was noted that we have a membership goal of one thousand members. We are looking for your input.

Roger Moeller stated that the general sales tax concerning our membership from Canada is still an issue. Therefore, we will not solicit members. We will not, however, turn down any.

Discussion was held on the raising of dues and the length of time that it takes to have these dues increases implemented. At present it takes three years to become valid. President Roger Moeller made an Executive Directive, stating that the Constitution and By-Laws Committee, consisting of Don Rumrill and Richard Wakeman, prepare a proposal to amend the dues structure of the by-laws. The change would eliminate the dollar amount so that in the future the dues may be changed by the Executive Committee and voted upon by the membership at the next Business Meeting.

It was announced that the next ESAF meeting will be in November in Pittsburgh, Pennsylvania.

After discussion it was decided to disband the *Avocational* as a newsletter for the Association.

A decision was made that the ballots for the NYSAA elections would be mailed out with the NYSAA announcements and registration information with a return addressed envelope enclosed for the members' convenience.

A vote was taken in the affirmative to combine the Executive and Business meetings into one meeting to take place on Friday evening.

It was announced that the Triple Cities Chapter is celebrating its 25th Anniversary this year. Congratulations were offered.

¹ Because of the unavailability of the 1992 minutes. I have compiled the report to the best of my memory and by using the tapes which were not very clear and were difficult to hear. M.E.G.

The nominees for officers were presented and voted into office, they are as follows:

President	Robert J. Gorall
Vice President	Albert LaFrance
Treasurer	Carolyn Weatherwax
Secretary	John McCashion

A motion was made by Richard Wakeman that because in the past the office of President had become vacant due to death, the by-laws should be amended to read: *In case of the vacancy of an office due to death or illness, the highest remaining officer would be authorized to appoint a replacement to act as pro tem and to conduct a telephone voice vote of each member of the Executive Committee.* A simple majority would fill the vacant office. The telephone vote tally would then be presented to the floor of the next NYSAA Business Meeting, and the acting replacement could be then voted into office. The motion was seconded by Don Rumrill.

Following the direction of President Roger Moeller, a motion was made by Don Rumrill and seconded by Richard Wakeman that under Chapter One, Membership and Dues, of the by-laws, a new paragraph be

inserted to read: *The Executive Committee members recommend that the amount of the annual dues for the various classes of memberships be changed subject to the approval of the membership; that under Chapter One paragraphs 8-14, all dollar amounts contained be deleted; that under Chapter 6 paragraph 2C the first sentence be rewritten to read: Each chapter shall remit to the association the various classes of membership accounts commensurate with the changes in the dues structure to be recommended by the Executive Committee members and subject to the approval of the membership; that under Chapter One paragraphs 8-14, all dollar amounts contained therein be deleted.*

Richard Wakeman is checking into the legality of the issue of dollar amounts being eliminated.

These motions made by the Constitution and By-Laws Committee will be brought to the floor for a membership vote at the next Business Meeting.

The 77th Annual Meeting will be hosted by the Houghton Chapter in 1993 at Niagara Falls, New York.

The meeting was adjourned.

Muriel E. Gorall, Secretary

Report of the Treasurer, April 25, 1992

Adirondack Trust Co.

4/12/91

CD#37220016112 \$6,281.14

MMDA#7922385 4,854.02

NOW Acc't. #2945406 2,493.09

Cash Receipts 1991-1992

Dues \$7,031.50

Publication Sales 535.76

Interest NOW Account #2945406 112.78

Transfer from MMDA #7922385 1,000.00

TOTAL \$8,680.04

TOTAL RECEIPTS \$8,680.04

Bal. Ck. Acc't. (4/12/91) 2,493.09

TOTAL \$11,173.13

Disbursements (1991-1992) -8,630.41

TOTAL \$2,542.72

Checking Account Service Charge -10.60

BALANCE 4/20/92 \$2,532.12

4/20/92

CD#37220016112 \$6,723.20

Int. 1991-1992 442.06

MMDA#7922385* 4,088.90

Int. 4/30/91-3/31/92 234.88

NOW Acc't. #2945406 2,532.12

Int. 3/29/91-3/31/92 112.78

TOTAL ASSETS \$13,344.22

Disbursements 1991-1992

Brennan Memorial Volume \$1,000.00

Refund Dues 9.00

1992 ESAF Dues (715 members) 153.00

Secretarial Expenses 530.00

Archaeological Services 328.07

Bethlehem Printing Company (forms) 114.00

Miscellaneous (flowers) 60.29

Refund Bulletin Sales AS 7.50

The Bulletin No. 102 4,952.04

The Bulletin No. 103 1,096.00

75th Programs 375.51

RMSC Postage 5.00

TOTAL \$8,630.41

*Less \$1,000 transferred to NOW account

Carolyn O. Weatherwax, Treasurer

Program of the 76th Annual Meeting New York State Archaeological Association

April 24, 25, and 26, 1992

Host: Inc. Orange County Chapter

Friday, April 24, 1992

12:00 pm	NYSAA Registration
1:00 pm	NYAC Board Meeting
2:00 pm	Tour of Fort Decker and Port Jervis Erie Depot Museum. Car pool with local guide.
2:00 pm	NYAC Business Meeting
3:30 pm	Tour of Fort Decker and Port Jervis Erie Depot Museum. Car pool with local guide.
6:00 pm	Buffet Dinner
7:00 pm	Awards Committee Meeting
7:00 pm	NYSAA Executive Committee Meeting
8:00 pm	Welcoming Slide Lecture: <i>The View from the Eddy Farm: Hysterical-Historical Tales of the Upper Delaware Valley</i> Frank Patterson, Eddy Farm Hotel
9:00 pm	Social Gathering (cash bar)

Saturday, April 25, 1992

8:00 am	NYSAA Registration
9:00 am	Welcome Roger W. Moeller, President, NYSAA Kirsten Brophy, President, Louis A. Brennan Lower Hudson Chapter

Morning Session: Prehistoric Session
Chair: Edward J. Lenik, Sheffield Archaeological Consultants, Inc., Orange County Chapter

9:15 am	<i>What Happened in the Early Woodland.</i> Stuart Fiedel, EBASCO Environmental
9:40 am	<i>Early Late Woodland Horticultural Societies: The View from Southern New England</i> Lucianne Lavin, Archaeological Research Specialists
10:05 am	<i>The Indians of the Minisink Area</i> Herbert C. Kraft, Seton Hall University Museum
10:30 am	Coffee Break
10:50 am	<i>The Piping Rock Site: Analysis of Late Woodland Storage Pits</i> Roberta Wingerson, Louis A. Brennan Lower Hudson Chapter
11:15 am	<i>What Can Be Learned from Plow--one Sites: A Case Example from the Hudson Valley</i> Linda Stone, Metropolitan Chapter
11:35 am	<i>Shell Middens and Settlement in the Lower Hudson Valley</i> Hans F. Schaper, Louis A. Brennan Lower Hudson Chapter

12:00 Lunch

Afternoon Session: Historic Archaeology Symposium,
*Getting the Gray Out: Contributions to Historic Archaeology
from Contract Work*

Chair: Karen S. Hartgen, Hartgen Archaeological Associates,
Inc., Van Epps-Hartley and Orange County Chapters

- 1:30 p.m. *Manhattan's Colonial Slave Burial Site:
An In-Progress Report*
Edward S. Rutsch, Historic Conservation
and Interpretation, Inc.
- 1:55 p.m. *Archaeological Research at the Amherst
Centre House Tavern Site, Erie County,
New York*
Elaine B. Herold and Lynn K. Cowan,
SUNY Buffalo
- 2:20 p.m. *Chittenango Landing Canal Boat
Museum 1986-1991: The First Five
Years*
Joan Dichristina, W.M. Beauchamp
Chapter and Doug Rainbow, C.L.C.B.
Museum
- 2:45 p.m. Coffee Break
- 3:05 p.m. *Inequality in the Parlor City: Evidence
from the Binghamton Town Mall Site*
LouAnn Wurst, SUNY Binghamton
- 3:30 p.m. *Urban Archaeology in Rochester: Ten
Years of Uncovering the Past Along the
Genesee River*
Brian Nagel, Rochester Museum &
Science Center/ Lewis Henry Morgan
Chapter
- 3:55 p.m. *The Civil War- Gun Makers of West
Point Foundry: Archaeological Evidence
for the Presence of Imported European
Technology and Specialists in the
Development of Heavy Ordnance*
Joel Grossman, Grossman and
Associates, Inc.
- 4:20 p.m. *The Nineteenth Century Mountain Farms
of Glen Aeyre*
Nancy L. Gibbs, Sheffield
Archaeological Consultants
- 6:30 p.m. Happy Hour (cash bar)
- 7:30 p.m. Annual Banquet

Master of Ceremonies: Roger W.
Moeller, President NYSAA
Keynote Address: *New Research at the
Island Field Site, Kent County,
Delaware: Implications for the Study of
Point Peninsula Sites in Eastern North
America*
Jay F. Custer, Professor of
Anthropology, Director, Center for
Archaeological Research, University of
Delaware

Sunday, April 26, 1992

Morning Session: Current Research

Chair: Kirsten Brophy
Louis A. Brennan Lower Hudson Chapter

- 9:00 a.m. *The Jefferson County Iroquoians*
William Engelbrecht, Buffalo State
College
- 9:25 a.m. *Cortland County, New York,
Archaeology, 1990-1991*
Ellis E. McDowell-Loudan, SUNY
College at Cortland and Gary L. Loudan,
W. M. Beauchamp Chapter
- 9:50 a.m. *Native Americans of Coastal New York:
The Montauk of Eastern Long Island*
Gaynell Stone, SUNY Stony Brook
- 10:15 a.m. Coffee Break
- 10:30 a.m. *A Comparison of the Ownership and
History of Two Important Indian
Archaeological Sites*
Walter L. Smith and Frances O'Connell,
The Inc. Long Island Chapter
- 10:55 a.m. *Flutes Along the Kittle*
R. Alan Mounier, Jack H. Cresson, and
John W. Martin
- 11:20 a.m. *The Chemical Variability of Carbonized
of Organic Matter through Time*
Douglas S. Frink, Archaeological
Consulting Team, Inc.
- 11:45 a.m. *Nodular- Cherts of the Cambri-
Ordovician Kittatinny Supergroup: Their
Diagenesis Stratigraphic Relevance and
Archaeological Potential*
Philip C. LaPorta, Hunter College, CUNY

The Achievement Award

Charles M. Knoll (1958)
Louis A. Brennan (1960)
William A. Ritchie (1962)

Donald M. Lenig (1963)
Thomas Grassmann O.F.M. (1970)
Paul L. Weinman (1971)

Robert E. Funk (1977)
Peter P. Pratt (1980)
Herbert C. Kraft (1989)

Fellows of the Association

Monte Bennett
James W. Bradley
Louis A. Brennan
William S. Cornwell
Dolores N. Elliott
William E. Engelbrecht
Lois M. Feister
Robert E. Funk
Thomas Grassmann O.F.M.
Alfred K. Guthe
Gilbert W. Hagerty
Charles F. Hayes III
Franklin J. Hesse
Richard E. Hosbach

Paul R. Huey
R. Arthur Johnson
Edward J. Kaeser
Herbert C. Kraft
Roy Latham
Lucianne Lavin
Donald M. Lenig
Edward J. Lenik
Julius Lopez
Richard L. McCarthy
James F. Pendergast
Peter P. Pratt
Robert Ricklis
William A. Ritchie

Bruce E. Rippeteau
Donald A. Rumrill
Bert Salwen
Harold Secor
Dean R. Snow
Audrey J. Sublett
James A. Tuck
Stanley G. Vanderlaan
Paul L. Weinman
Thomas P. Weinman
Marian E. White
Theodore Whitney
Charles F. Wray
Gordon K. Wright

Certificate of Merit

Thomas Amorosi
Roger Ashton
Charles A. Bello
Monte Bennett
Daniel M. Barber
Malcolm Booth
James W. Bradley
Art Carver
Gordon De Angelo
Elizabeth M. Dumont
Lewis Dumont
William F. Ehlers
Dolores N. Elliott
Garry A. Elliot
John Ferguson
Joan H. Geismar
Stanford J. Gibson

Gwyneth Gillette
Robert J. Gorall
R. Michael Gramly
George R. Hamell
Elaine Herold
Franklin J. Hesse
Richard E. Hosbach
Paul R. Huey
Albert D. La France
Kingston Larner
Edward J. Lenik
William D. Lipe
John H. McCashion
Dawn McMahon
Jay McMahon
Brian L. Nagel

Marjorie K. Pratt
Peter P. Pratt
Louis Raymond
Barbara Sciully
Harold Secor
Annette Silver
Mead Stapler
David W. Steadman
Marilyn C. Stewart
Neal L. Trubowitz
Charles E. Vandrei
James P. Walsh
George R. Walters
Beth Wellman
Henry P. Wemple
Roberta Wingerson
Stanley H. Wisniewski