The Bulletin

Number 45       March 1969

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THE KINGS ROAD SITE: A RECENTLY DISCOVERED PALEO-INDIAN MANIFESTATION IN GREENE COUNTY, NEW YORK*

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Paul L. Weinman, NYSAAF

Van Epps-Hartley Chapter
Auringer-Seelye Chapter
Auringer-Seelye Chapter

Introduction

Greene County, located on the west side of the Hudson River between Albany County, to the north, and Ulster County, to the south, has in the last 15 years begun to yield an abundance of archeological secrets to unremitting researches by amateur and professional prehistorians. This richness must be the consequence of factors especially favorable for aboriginal occupation, such as good food supplies and a topography permitting rapid movement along the valley. Also important, however, were the extensive, often massive, outcrops of high-grade gray or green flint in some of the many north-south trending ridges of Normanskill shale, a formation of Ordovician age (Goldring, 1943). Several great flint quarries, the most famous being Flint Mine Hill near Coxsackie, attest to the attractive qualities of this flint from an aboriginal viewpoint (Parker, 1924).

Thus, following investigations by William A. Ritchie (1958) at the Lotus Point and Van Orden sites, both located in Greene County, a number of sites known to local collectors were reported after a highly successful survey conducted in 1962-63 by F. F. Schambach (n.d.) in cooperation with the New York State Museum Anthropological Survey. Several of these sites were subsequently tested and, proving to be productive of subsurface cultural deposits, were excavated; a few other sites were discovered for the first time (Ibid.). Final reports on the excavated sites are being prepared by the senior author.

In April, 1963, a large Paleo-Indian quarry-workshop-campsite was discovered at West Athens Hill by R. Arthur Johnson, of Van Epps-Hartley chapter, NYSAA (Funk and Johnson, 1964). Excavations directed by Funk in July, 1966 established the site as the largest of its period so far found in New York State; in some ways it is unique in the East (Funk, 1967). The final report is in manuscript (Funk, n.d.).

In September, 1966, during a survey, on foot, through the large central area of Greene County, Thomas Weinman came upon the Kings Road site which, though small in surface area, has yielded numerous artifacts of Early Man. Subsequently, he and his brother Paul went on to find several other informative sites of later periods within the borders of the county. This paper focuses on the extremely important Kings Road station.

Neither the precise location of the site, nor the name of its owner, can be divulged at this time, due to the threat of plundering by collectors who are currently active in the county. However, it is safe to say that the site is conveniently located with respect to several flint quarries, including West Athens Hill. It lies on a very low, almost imperceptible, rise in a large, cultivated field. Nearby is a small swale which adjoins the seasonally intermittent headwaters of a brook. Not far away are a number of higher, more prominent knolls and ridges which, it would seem, would have been more logical choices for a Paleo-Indian camp. When examined these areas evinced few or no traces of aboriginal utilization.

Investigations

The site, when discovered, had been freshly plowed and yielded flint flakes and artifacts (including scrapers and fluted points) within an area of primary concentration which measured 80 by 50 feet. Numerous test pits dug by the present authors disclosed a hard

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Plate 1. Kings Road site, Greene County, N.Y. Fig. 2-4, damaged fluted points; 5, possible fluted point midsection; 1, 6-9, fluted points in process; 11, 13, large biface knives (stage C bifaces); 12, 18, large biface knives (stage B bifaces); 10, knife on crude bifacially worked spall (miscellaneous biface); 14, 15, small, much-worn enigmatic (miscellaneous) bifaces; 16, beaked object (miscellaneous biface); 17, stage A biface; 19, lobate-stemmed (miscellaneous) biface.

Materials: Fig. 2, red Pennsylvania jasper; 4, smoky gray chalcedony; all other Normanskill flint.
clay subsoil below the foot-thick plow zone; no features were encountered. Nevertheless, in the hope that hearths or pits were present, an L-shaped trench was staked out in the center of the site. Five five-foot squares were excavated, for a total area of 125 square feet. The plow zone was troweled out because many chips and occasional artifacts were scattered through it. Unfortunately, no subsurface features were found. Subsequently, the site was surface-hunted repeatedly in 1967 and 1968. Not only artifacts, but all flint debitage, were collected so that, presently, traces of occupation are nearly absent on the surface.

Artifacts

Unless otherwise indicated, all artifacts described below are of local Normanskill flint. A total of 371 artifacts were recovered, as of winter, 1969.

The cover illustration, drawn by Gwyn Gillette, shows a representative sample of artifacts from the site.

Bifaces: projectile points

Three fragments of finished fluted points were found. The first discovered (plate 1, fig. 4) is of a gray, high-grade semi-translucent chalcedony, representing only the basal portion of a bifacially fluted point. Both lower edges and base are lightly ground. This portion has a maximum width of 27 mm, and a maximum thickness of 5 mm. On both faces the upper portion of the main channel scar is missing. One face bears what may be the remnant of a lateral flake scar adjoining the main flute, suggesting the "Enterline" technique (Witthoft, 1952). The base is concave, and there is a tiny ear on one corner. Delicate pressure retouch is evident on what remains of the edges.

The second fluted point to be recovered, again consisting of a basal portion, is of red Pennsylvania jasper (plate 1, fig. 2). Both faces are fluted; one face, again, evinces multiple flaking from the base. The indented base and lower edges show heavy rubbing. One corner is broken, but the other is slightly eared. The edges are evenly flaked by pressure-retouch. The fragment measures 30 mm in width and 6 mm in thickness.

The third and smallest point is badly fire-spalled (plate 1, fig. 3). However, enough remains to ascertain that both lower edges were heavily ground, and that channel flakes had been removed from both faces. The point was approximately 40 mm long; its maximum breadth is 28 mm, its thickness 7 mm. The edges were finely retouched.

Only one non-Paleo-Indian point, of late Archaic origin, was recovered on the site. It was of Snook Kill type, picked up on the extreme eastern fringe of the chip scatter.

Midsection fragments of two finished projectile points, possibly of fluted form, are in the collection. One piece (plate 1, fig. 5) has a maximum breadth of 37 mm and is 6 mm thick. Despite its relative thinness, one edge is irregularly sinuous perpendicular to the plane of the blade, and all chipping was done by percussion. A second fragment is 37 mm wide and 12 mm thick, and well-fashioned.

There are two additional point fragments, of indeterminate form, measuring, respectively, 19 mm and 16 mm in breadth, and 7 mm and 5 mm in thickness.

Five probable preforms for fluted points are represented by four basal sections and one near-basal midsection. These objects range from 37 to 52 mm in maximum breadth; those with intact bases tend to be narrower at the base than near midpoint. The thickness variation is 10-11 mm. In two cases (plate 1, fig. 7, 9) a large, broad channel flake had been struck from one face. In two other cases, (fig. 1, 6) such flakes are missing from both faces. The preform in fig. 1 broke when one flake hinged into the blade and seems to have been broken again later at the base. Slight basal grinding is present on fig. 6 and 9, perhaps to facilitate the "bite" of the percussion tool (possibly a punch was used) against the striking platform (MacDonald, 1968, p. 68). Fig. 6, 7, and 9 also have traces of steep,
Plate 2. Kings Road site, Greene County, N.Y. End scrapers. Fig. 6, 9-12, 14-20, 23-24, spurred variety. All others standard trianguloid or trapezoidal variety.

Materials: 1, 22-24, brown Pennsylvania jasper; 2-4, 9, 10, red Pennsylvania jasper; 5, 21, 25, red and yellow Pennsylvania jasper; all others Normanskill flint.
unifacial beveling along the base which was intended to produce the striking platform for the channel flake on the obverse face. In each case the beveling was only partly obliterated by removal of the flake. The biface in fig. 8 lacks fluting.

All five artifacts display irregular, relatively large flake scars along the edges, created by percussion. No fine retouch is present. These preforms were evidently in the last stages of thinning, prior to the more precise and controlled manufacture of finished fluted points by pressure flaking and grinding.

Bifaces: stages A, B and C

Bifacial objects other than finished projectile points or identifiable blanks for points numbered 83. Of this group, 57 can be arbitrarily divided into subgroups which appear to represent successive steps or stages in the process of reducing the raw stone materials to the desired end products. Thus some of the objects classified as stage A, B, or C bifaces may have been intended as fluted points. Others were probably visualized by the artisans as ovate or lanceolate knives. Some bifaces were discarded prior to completion due to faulty technique or flaws in the stone; others were doubtless lost or, for whatever reason, simply not used or needed by the flint-knappers. In certain instances, relatively crude, unfinished bifaces were apparently picked up and used for cutting or chopping.

Technically, the fluted point preforms fall into the category of stage C (advanced) bifaces, but have already been considered under the projectile point heading.

Stage A bifaces

In this group are 36 whole or fragmentary items (plate 1, fig. 17). These crude, rather thick objects appear to comprise the first steps in reduction from a core or spall. Most of them are, or were, of roughly ovate shape. Percussion chipping has resulted in broad, deep, unevenly placed flake scars, and there are usually unmodified facets of the original flint core. These objects might be referred to as "quarry blanks," roughed out at the quarry and carried to the site for final shaping.

<table>
<thead>
<tr>
<th>N</th>
<th>Mean</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>77.7</td>
<td>54-115</td>
</tr>
<tr>
<td>36</td>
<td>49.1</td>
<td>32-97</td>
</tr>
<tr>
<td>36</td>
<td>19.1</td>
<td>9-59</td>
</tr>
</tbody>
</table>

Six of the stage A bifaces evince deliberate retouch, usually along a short section of one edge. On four examples in this group the retouching seems to have been aimed at producing a cutting edge; three of these artifacts also evince traces of wear on the edges. Two bifaces were modified into side scrapers.

Unretouched stage A bifaces displaying signs of utilization are 20 in number. The remainder are simply discarded preforms.

Non-local stone was used for only one stage A biface, of Fort Ann flint.

Stage B bifaces

Bifaces in this category have been further reduced toward the final product from the cruder stage A. Flaking is still by percussion, but applied more evenly, with less force. A more definite and symmetrical form is emerging. Thickness is a critical factor in comparisons, because only three stage B bifaces are whole.
Plate 3. Kings Road site, Greene County, N.Y. Fig. 1-10, 13, side scrapers; fig. 11, heavy concave scraper and chopping tool; 12, flint pebble hammerstone.
Materials: Fig. 1, brown Pennsylvania jasper; 2, Flint Ridge, Ohio chalcedony; 3-13, Normanskill flint.
Fourteen objects are placed in the group. Ten show light to heavy wear on one or both edges (plate 1, fig. 12, 18). Only two of the ten appear to have been intentionally retouched for use as knives.

Table 2
Metrical Data on Stage B Bifaces (in millimeters)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>3</td>
<td>58.0</td>
<td>49-80</td>
</tr>
<tr>
<td>Width</td>
<td>14</td>
<td>43.5</td>
<td>31-52</td>
</tr>
<tr>
<td>Thickness</td>
<td>12</td>
<td>13.2</td>
<td>10-21</td>
</tr>
</tbody>
</table>

Stage C bifaces

There are only seven of these "advanced" bifaces other than fluted point preforms. None is whole. These items are rather symmetrical, relatively thin, and have attained a definite shape. Most, if not all, appear to have been large ovate, bipointed, or lanceolate knives (plate 1, fig. 11, 13). Only two of the group lack traces of utilization.

Table 3
Metrical Data on Stage C Bifaces Other Than Fluted Point Preforms (in millimeters)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Range</th>
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<tr>
<td>Width</td>
<td>7</td>
<td>42.1</td>
<td>30-57</td>
</tr>
<tr>
<td>Thickness</td>
<td>7</td>
<td>10.9</td>
<td>7-15</td>
</tr>
</tbody>
</table>

Miscellaneous bifaces

This category is a catch-all for bifacially worked implements which cannot be easily placed in stages A, B, or C, or which display attributes suggesting special functions.

One tool is a quarry blank 74 mm long, 44 mm wide, and 18 mm thick, one end of which was modified by retouching to a sharp-edged lobate projection (plate 1, fig. 16). This appears to have been a heavy-duty cutting tool.

Another rude biface, lacking its tip, chipped from a natural flint slab, evinces heavy wear on the edges, manifested as grinding and blunting (fig. 10).

A thick, lobate-based object 130 mm long, 60 mm wide, and 22 mm thick (fig. 19) bears few traces of wear on the sharp, irregular edges, but the base was deliberately retouched to form a semi-circular cutting edge. Minute step-flaking indicates that during use the edge was pressed against some unyielding surface; no polish is evident.

There are two small, bifacially worked and much-used objects, very similar in shape, which are unique to the authors' experience (fig. 14, 15). In each case one long edge, at the broadest part, is only rudely flaked, while the opposite edge has two concave working edges. One tool also has one broad, evenly chipped end, while the other has no retouch at the corresponding end; each has a beak-like projection at the opposite end. Whereas all the edges feature signs of utilization, in the form of small crushed-off chips, the concave edges are most heavily worn, and in places appear to have been heavily battered.

The purpose served by these tools must remain conjectural. Possibly they were used as spokeshaves in shaping wooden weapon shafts. Or, they may have served as wedges in splitting bone or antler (MacDonald, 1968, pp. 85-90). They measure, respectively, 37 and 45 mm in length, 18 and 25 mm in breadth, and 7 and 10 mm in thickness.
Also deserving special note is a biface tip fragment, which was retouched, after breaking, along the broad end to create graving spurs at each corner.

Among the other miscellaneous bifaces are: five broad, flat flakes with bifacially retouched knife edges; four broken bifaces retouched on one or both edges for use as knives; four small, indeterminate fragments of biface blades; six possible ovate biface cores; and a chopper-like tool based on a broken biface, with heavily worn semicircular edge.

Unifaces

End scrapers (plate 2)

Forty-seven end scrapers are in the inventory, usually consisting of medium-sized expanding ovate flakes struck from cores and invariably retouched on the dorsal face to a steep working edge at the broad end (opposite the striking platform).

Of the total number, 39 are of classic triangular or trapezoidal shape, 3 are oblong, 3 are oval, and 2 are irregular in outline. On 23 examples, the broad end and both sides are retouched; on 8 pieces, the end and one side are retouched; only the end has been modified on 15 scrapers; and 1 specimen is fragmentary.

The striking platform has been removed from all but 15 scrapers. Fourteen examples have slight to prominent graving spurs on one or both front corners (plate 2, fig. 6, 9, 10, 11, 12, 14-20, 23, 24).

Evidence of wear, consisting of edge-crushing or the removal of tiny flakes by friction against some hard material, is present on all of the scrapers. It is visible on the end and both sides of 35 scrapers; on the end and one side of a single example; on both sides of the broken specimen; and on the end only in 10 cases.

### Table 4

<table>
<thead>
<tr>
<th></th>
<th>N</th>
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</thead>
<tbody>
<tr>
<td>Length</td>
<td>45</td>
<td>33.7</td>
<td>19-55</td>
</tr>
<tr>
<td>Width</td>
<td>46</td>
<td>24.5</td>
<td>14-41</td>
</tr>
<tr>
<td>Thickness</td>
<td>46</td>
<td>8.6</td>
<td>4-13</td>
</tr>
</tbody>
</table>

A higher percentage of exotic lithic material was used for end scrapers than for any other class of artifacts. Brown, yellow, or red Pennsylvania jasper was employed for 13 scrapers. A maroon-colored jasper possibly derived from northern New England deposits it could have been carried south by the Wisconsin glacial ice-was used in two cases (Ritchie, personal communication).

Side scrapers (plate 3, fig. 1-10, 13; plate 4, fig. 11, 13, 14, 15).

This category embraces 66 objects, highly variable in form, which possess the unifying attributes of 1) generally large size, and 2) one or more long scraping edges, parallel or oblique to the long axes of the flakes on which they are based, produced by steep retouch. Most of these tools are on secondary or tertiary flakes, but six are based on retouched cores and six on natural vein plates of flint. Of the scrapers based on flakes, 22 retain the striking platform. The majority of trimmed flake side scrapers conform in a general way to Byers' "ear-shaped" category for the Bull Brook site in Massachusetts (Byers, 1954). Only one example can be termed a convergent scraper, with two beveled edges joined at a tip (plate 3, fig. 8). There is also an oval scraper in the collection, on which the two curved edges just fail to meet at each end (fig. 7). Of the remaining scrapers, 46
were retouched, for varying distances, along one edge only; 15 possess two retouched edges; and three have been beveled on three edges.

All of the side scrapers display wear on one or more edges, ranging from slight to heavy.

Eight specimens were fashioned from exotic stones; three are of brown, yellow, or red Pennsylvania jasper, one of red New England (?) jasper, one of Flint Ridge, Ohio, chaledony, and one of eastern Onondaga flint.

Table 5
Metrical Data on Side Scrapers (in millimeters)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>65</td>
<td>62.6</td>
<td>30-114</td>
</tr>
<tr>
<td>Width</td>
<td>65</td>
<td>42.1</td>
<td>22-71</td>
</tr>
<tr>
<td>Thickness</td>
<td>65</td>
<td>15.8</td>
<td>6-31</td>
</tr>
</tbody>
</table>

Flake knives (plate 4, fig. 1-3, 5, 6, 10, 12)

The 41 worked uniface items classified as knives differ from side scrapers in their generally smaller size, and in the relative shallowness and thinness of the retouched working edge. No absolute criteria exist for separating the two artifact types, which really constitute metrical intergrades on the spectrum of flakes retouched along edges parallel or oblique to the long axes. Obviously, a tool primarily used as a side scraper could occasionally have served as a knife, and vice versa.

A majority (35) of knives are retouched along one edge only. Four pieces are retouched on two edges, and two on three edges. Two knives also have short spokeshaves on the bulbar faces. Wear is universally present on one or more edges.

All of the knives are on flakes, except for one modified from a small naturally occurring slab. In 22 cases the original striking platform is still present.

Red Pennsylvania jasper was used for two knives; all the rest are of Normanskill flint.

Table 6
Metrical Data on Flake Knives (in millimeters)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Range</th>
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<tbody>
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<td>Length</td>
<td>41</td>
<td>48.4</td>
<td>22-87</td>
</tr>
<tr>
<td>Width</td>
<td>41</td>
<td>33.7</td>
<td>15-55</td>
</tr>
<tr>
<td>Thickness</td>
<td>41</td>
<td>9.8</td>
<td>3-20</td>
</tr>
</tbody>
</table>

Spokeshave scrapers

Three objects with concave retouched edges are in this category. All were made from flakes. They range from 30 to 65 mm in length, 26 to 57 mm in breadth, and 7 to 20 mm in thickness. These items bear signs of utilization.

Concave scraper and chopping tool

This heavy tool (plate 3, fig. 11) is based on a core modified by percussion to produce a large, bifacially sharpened, semicircular cutting or chopping edge. Adjoining this edge is a massive concave scraper. Heavy wear is visible on both working parts. The semicircular edge bears a number of deep hinge flake scars, evidently produced by blows against some object with the long axis of the tool perpendicular to the object.
Plate 4. Kings Road site, Greene County, N.Y. Fig. 11, 13, 14, 15, side scrapers; fig. 1-3, 5, 6, 10, 12, retouched flake knives; 4, 7-9, utilized flake knives.

Materials: 1-10, 13-15, Normanskill flint; 11, red Pennsylvania jasper; 12, red and yellow Pennsylvania jasper.
Retouched flakes

This category includes ten miscellaneous items which do not conform neatly to the other artifact classes. In each case one or two edges evince retouching which is of variable length and frequently irregular or intermittent. All are on flakes but one, which is on a natural plate. The variation in length is 29 to 66 mm. Breadth varies from 19 to 56 mm, and thickness ranges from 7 to 21 mm.

Utilized flakes and cores

Thirty-five cores have been employed for a variety of purposes, including chopping, pounding, cutting, and scraping, as evidenced by characteristic patterns of wear on facets, edges or projections. Of the total, at least one seems to have been used as a chopping tool. Four cores evincing much battering fall into the category of flint pebble hammerstones (plate 3, fig. 12). The remaining cores were apparently utilized as scrapers or knives.

There are 71 utilized spalls and flakes, most of which seem to have served as knives (plate 4, fig. 4, 7-9). One utilized core is of local Kalkberg flint. Two utilized flakes are of eastern Onondaga flint and one is of Pennsylvania jasper.

Abrading-stone

A roughly tabular slab of sandstone, 154 mm long, 52 mm wide, and 31 mm thick, has one flat, smooth surface bearing a number of very fine grooves. The striations and the polished surface must have been produced by abrasion with another hard substance such as bone or stone.

Evidence of fire

A number of artifacts are spalled from intense heat. This effect could have been caused by old forest fires, or by burning in Indian hearths. No burned patches of soil were observed below plow zone in excavated squares. However, five fire-cracked stones were picked up from the site, which may have come from Paleo-Indian hearths.

Lithic Technology

The total of debitage collected on the site amounts to 158 cores and 5350 chips and spalls. Beyond doubt much debitage remains on the site in the tilth zone, but the recovered sample should be adequate for technological studies and rough comparisons with other sites.

As of this writing, a precise analysis of core types, flake morphology, and other aspects of flint-knapping methods remains to be made. However, preliminary generalizations can be offered.

The majority of cores—perhaps 80 percent—are flint blocks or block fragments detached from matrices on the nearby quarries by hammering. These cores are fist-size or smaller, irregular in shape with angular facets and sharp edges. They were worked by removing flakes from almost any convenient striking platform, obtained by turning the core around until too small to be useful. The edges occasionally display crushed-off flakes or a battered appearance, not due to use as tools but to repeated blows from the chipping hammer. In this category could also be placed most of the 35 utilized cores which, however, show signs of use as scrapers or cutting tools. There are no traces of ground striking platforms similar to those reported for some Early Hunter assemblages.
The minority of cores are simply small vein plates or what Fitting (1966) calls "block fracture flakes." These are of flat, rectangular form, usually with weathered surfaces, and tend to be smaller than the other cores. Some of the vein plates from the site have not been worked at all.

The 5350 flakes comprise a variety of types. At least 75 percent are thin to moderately thick expanding ovate, triangular or irregular flakes with distinct striking platforms. Nearly all bear the scars of flakes previously removed from the core on their dorsal faces; only rare examples are primary decortication flakes. A major portion of the remaining flakes are thick, often steeply keeled, and are clearly spalls removed in trimming cores. Finally, a minor quantity of small flakes with little or no trace of striking platforms and bulbs of percussion appear to be retouch flakes.

Nearly all of the utilized flakes are of the majority category with striking platforms.

Comparisons

It was immediately obvious to the present writers on first perusing the Kings Road collection that there were marked similarities to the materials from West Athens Hill. These correspondences consist of lithic preferences, lithic technology, and tool types.

On both sites, gray or green Normanskill flint from local outcrops is the most important raw material. Minor amounts of red, brown, or yellow Pennsylvania jasper, scoriaceous blue and tan mottled Fort Ann (New York) flint, black Kalkberg flint from the near by Helderberg escarpment, and a smoky chaledony of undetermined origin are common to both sites. Gray, tan-streaked eastern New York Onondaga chert, maroon New England (?) jasper, and Flint Ridge, Ohio, chaledony occurred only at Kings Road; chert from the western New York Onondaga limestones, blue-black mottled Upper Mercer, Ohio, flint, black grainy Oriskany flint from the Mohawk Valley, quartz, quartzite, and an exotic brown-speckled creamy flint were found only at West Athens Hill.

Although West Athens Hill was far larger and more productive than the Kings Road station (1467 and 371 artifacts, respectively) the latter yielded a higher percentage of items chipped from non-local stones than did the former (9 percent to 2.6 percent). At Kings Road, Pennsylvania jasper comprised 67 percent of exotic stones, in contrast to 27 percent at West Athens Hill. On both sites, approximately 43 percent of artifacts fashioned from such materials are end scrapers. Side scrapers rank second in this regard.

The proportion of the number of artifacts recovered to area of site (expressed in square feet) is roughly 1 to 11 at Kings Road, far higher than the ratio of about 1 to 300 at West Athens Hill.

Methods of working flint were essentially identical at both sites. The same stages in the manufacture of bifaces are evident, and Unifaces were also produced in a similar manner. The important differences in lithic technology are clearly the result of differing site locations, in relation to local quarries.

The Kings Road site lies on clay flats a considerable distance from the nearest source of flint, whereas West Athens Hill is rich in veins of Normanskill flint. Flint was carried from the quarries (including perhaps West Athens Hill itself) to Kings Road in the form of quarry blanks (called biface cores by MacDonald, 1968), vein plates and small cores. There it was worked into artifacts. Limitations on the amount of raw material which could be carried to the site required a degree of economy. Only high-grade, useful flint in transportable chunks was brought to the site, and worked with a minimum of waste. Weathered, dried or badly flawed fragments were left at the quarry. Most cores were used until useful flakes could no longer be drawn from them, hence a relatively high ratio of chips to cores (34 to 1), and a low incidence of vein plates among artifacts and debitage. In contrast, West Athens Hill is littered with flint tailings, spalls and blocks with adhering rind or badly weathered surfaces, vein plates, and cores of all sizes. The lithic refuse from the site has not yet been studied in detail, but on an impressionistic basis, the ratio
of chips to cores may be lower than at Kings Road. However, it is certain that the proportion of debitage to artifacts is much higher at West Athens Hill. This value is only 14 to 1 at the Kings Road station.

Pebble hammerstones (166) are abundant at West Athens Hill, and come in all sizes. The larger ones were doubtless used to detach flint blocks and nodules from their sandstone matrix, and to shatter large pieces. Smaller hammerstones could conveniently have been employed for percussion chipping of artifacts. Nearly all of these tools are glacially rounded cobbles or pebbles, of elongate or oblate spheroidal shape, battered on one or both ends.

On the Kings Road site, however, only four pebble hammerstones were found, all based on flint cores, which show the characteristic starred pattern from pounding. There were no till exposures containing cobbles or pebbles in the immediate area, where several square miles of clay surface deposits surround the site. The site also produced a single abrading-stone, of which trait seven were found at West Athens Hill. Anvil-hammerstones and simple anvils-stones, present at the latter station, were absent at Kings Road.

In addition to stone hammers, it seems likely that bone and antler flakers were in the tool kit of the Early Hunters.

The great majority of flint flakes from both sites are of expanding ovate or trianguloid form, bearing distinct striking platforms at the narrow end or apex. There are a smaller proportion of small retouch flakes with relatively undeveloped bulbs of percussion or, frequently, no trace of a striking platform. The latter forms were apparently produced by pressure flaking. Cores are usually either of crude, thick, biface form, or block cores from which flakes were struck as the shape permitted; a small number tend to be conical at West Athens Hill.

There are no prepared cores or polyhedral cores, and true blades, in the sense of Upper Paleolithic blades in Europe, are extremely rare. Such blades, or "prismatic flakes" are not a consistent feature of Paleo-Indian assemblages in the northeastern United States, despite contrary statements by other writers (Witthoft, 1952; Byers, 1954), a fact first noted by the senior author in 1964 when studying the Potts site (Oswego County) materials (Ritchie and Funk, n.d.; Ritchie, 1965, p. 30).

The artifact typologies at West Athens Hill and Kings Road compare very closely. The basic functional types-fluted points, large biface knives, end scrapers, side scrapers, and flake knives-and bifaces in process, representing technological stages, are present on both. The miscellaneous bifaces, retouched flakes, and utilized flakes are fundamentally the same.

Percentage-wise, the frequencies of some types, e.g., fluted points, bifaces in process, and retouched flakes, are not significantly different between the two sites, but the end scrapers, side scrapers, and flake knives are relatively more abundant at Kings Road. On the other hand, utilized flakes and cores are more heavily represented at West Athens Hill, probably a consequence of the greater quantities of flint wastage there which could have been picked up and used at a moment's notice.

Thirteen finished fluted points, most of which had been broken in use, were found at West Athens Hill, as compared with three finished but damaged specimens at Kings Road. Twenty-four fluted points in process from West Athens Hill are indistinguishable in formal and technological attributes from the five examples from Kings Road.

The dimensions of all the biface and uniface classes from the two sites are so similar as to constitute virtual unity.

It is unfortunate that the Kings Road site has been plowed for many years, destroying all traces of the original relationships of the artifacts to the deposits and to each other. However, at West Athens Hill, which was never farmed, disintegrated rock and soil had accumulated in a hollow which was an important locus of habitation by Early Man. In two largely undisturbed strata were preserved considerable quantities of artifacts and chippage, though organic refuse had perished in the acid environment. The artifacts occurred in
clusters usually taking the form of arcs or semicircles averaging eight feet in diameter, suggesting centers of activity by nuclear family groups.

Turning to comparisons with more distant Paleo-Indian sites, the materials from the Davis site on Lake Champlain (Ritchie, 1965, pp. 19-22) are too scanty to be of much help. In artifact typology and in the predilection for local flint, there are strong similarities to the Hudson Valley data.

The Kings Road and West Athens Hill sites bear interesting similarities to, and contrasts with, the Potts site in Oswego County, central New York (Ritchie, 1965, pp. 16-30; Ritchie and Funk, n.d.). West Athens Hill is a unique quarry-habitation site on a high ridge; Kings Road covers a very low rise on clay flats near a swale; and Potts is located on a medium-sized drumlin, some 20 feet above an adjoining swamp and brook.

Of the three, Potts yielded the smallest amount of material (68 artifacts, including two fluted points). The material used in all but one of the artifacts is a seal-brown flint, provisionally identified as a variety of western Onondaga flint. Upper Mercer, Ohio, flint was used for one end scraper. The basic artifact inventory, i.e., points, end scrapers, side scrapers, bifaces and flake knives, closely equates with that from Kings Road and West Athens Hill. A beaked spokeshave-scaper and two narrow, elongate scrapers in the Potts collection have no equivalents on the other sites. The uniface tools at Potts are significantly larger in mean lengths and widths than the corresponding tools at West Athens Hill and Kings Road. The end scrapers from Potts are thicker than those from the Greene County components, but side scrapers and knives are much thinner, on the average.

Apparently, no bifaces in process were present on the Potts camp site, but thinly scattered chips show that a small amount of flint-knapping, perhaps largely for resharpening, took place.

Not directly relevant to the present comparisons is the Reagen site, located on a high hill in northwestern Vermont (Ritchie, 1953; 1957), which appears to be a relatively late Paleo-Indian manifestation. It has a number of unique features, including pentagonoid fluted points, unfluted lanceolates, triangular points, shouldered bifaces, and talc pendants. The single spokeshave-graver at Potts is matched by four at Reagen, but the form is absent from the other sites. Otherwise, the uniface tools at Reagen are very similar in shape and size to those at the Hudson Valley sites and the Potts site.

Typologically, the Kings Road, West Athens Hill, and Potts sites have a great deal in common with the Shoop site, eastern Pennsylvania (Witthoft, 1952), and the Bull Brook site in northeastern Massachusetts (Byers, 1954; 1955). Bull Brook lacks the biface knives common to all the other sites, but its "twist drills" are unique. Most of the Bull Brook recoveries occurred in unstratified, undisturbed subsurface sands, and were clustered in localized areas or "hotspots." Prior to its commercial destruction, the site occupied a low kame terrace overlooking a salt marsh, threaded by Bull Brook.

The Shoop materials were spread over the top of a large, high hill overlooking a creek and two tributaries. The proportion of waste flakes to artifacts was relatively low (about 3 to 1). The predominant lithic material was western New York Onondaga flint.

Farther afield, there are excellent data available from the Debert site, Nova Scotia (Byers, 1966; MacDonald, 1966; 1968). Again, the Debert materials possess some unique characteristics, e.g., the distinctive eared indented-base fluted points, certain cobble spall tools, and fluted-base drills, but in most other traits there are marked resemblances to the collections from Bull Brook, Shoop, West Athens Hill, etc. Also considerable information was obtained on settlement pattern which, combined with paleo-environmental studies, enabled MacDonald to reconstruct convincingly certain aspects of the Early Hunters' lifeway.

All of the eastern North American sites so far considered lack any trace of perishable objects or refuse in bone, wood, or antler, except for charred wood in Debert hearths.

Extending our observations outside the Northeast would seem fruitless at this time, except to note the general correspondences in tool types and lithic technology between the eastern sites and such western complexes as Clovis and Folsom.
It is clearly evident, however, that a reappraisal of methods and conceptual approaches is in order for Paleo-Indian studies in the Northeast. Model reports by a number of writers, recently published, have pointed the way. Among these works are the Holcombe report (Fitting, 1966) and the final Debert report (MacDonald, 1968). To date, most reporting of Early Hunter manifestations displays considerable diversity in methodology and manner of presentation. Especially uneven has been the handling of tool-manufacture patterns. An example is the erroneous attribution of a blade technology to the eastern Paleo-Indian, previously mentioned. Also a general lack of sophistication in analytical methods and in Old World Upper Paleolithic technology has resulted in the failure of many writers to recognize an important class of artifacts called *pieces esquillees*, apparently used to work bone, antler, and ivory (MacDonald, 1968, pp. 85-90). These tools do not seem to be a part of the tool kit at Kings Road nor, probably, West Athens Hill.

We might digress here to consider the problem of tool functions. The familiar end scrapers and side scrapers in Paleo-Indian assemblages are usually assumed to have been hide-working tools. We are not cognizant of ethnographic data which would tend to support this assumption, but a few important detailed experimental and microscopic researches have been made on prehistoric materials, notably that of Semenov (1964). It seems well-established that the Upper Paleolithic end and side scrapers from various Russian sites were employed to prepare hides, as evidenced by the striations and polish on the working edges (Ibid., pp. 85-93). Similar patterns of wear are present on the scrapers from Debert (MacDonald, 1968, p. 114; plate XIV). However, many of these scrapers have graving spurs which may have been used in slotting bone or antler. MacDonald believes the uniface industry at Debert to have served mainly to process caribou skins.

Funk has recently carried out microscopic examinations on a series of end and side scrapers from the West Athens Hill, Kings Road, and Potts sites, and in addition on a number of end scrapers from Middle Woodland contexts. Under a binocular microscope, at magnifications ranging from 10 to 40, the specimens were studied on all portions, at varying angles. Without exception, the pattern of wear on working edges was that of minute, irregular hinge-flakes, superimposed on the retouch flake scars. The flake arises and the edges along the ventral faces were invariably sharp and angular, and sharp projections remained between the crushed-off flakes. Clearly, this type of wear contrasts with the observed patterns on scrapers from Debert and the U.S.S.R. Upper Paleolithic. Also lacking were the signs of polish on the dorsal and ventral surfaces of the scrapers which Semenov attributes to direct manual contact. There can be no doubt that on the New York Paleo-Indian sites, both end and side scrapers were usually, if not exclusively, used on hard substances such as wood, bone, antler, and ivory. Thus, again unlike the Debert and Upper Paleolithic tools, the New York specimens may have been hafted in wood handles or antler sockets, since probably they could not have been effective on hard materials while held in the hand.

The characteristic signs of wear described by Semenov (1964, pp. 101-106) for meat knives are visible on the biface knives from Potts, Kings Road, and West Athens Hill. These signs consist of blunted, glossy surfaces on high points along the once-sharp edges of the knives. Frequently, tiny striations parallel to the edge are discernible on the worn surfaces, and less often glossy areas extend for a millimeter or two back from the cutting edge.

**Conclusions**

The interpretations offered here do not purport to deal with the full range of Paleo-Indian phenomena in the Northeast, nor is it claimed that the available Hudson Valley data have been utilized to their greatest possible extent. Much of the data are presented in a larger synthesis by Funk (n.d.).
Certain general conclusions can be drawn against the broader background elucidated by Ritchie (1965, pp. 1-30) and MacDonald (1968). Early Man entered the Northeast after the Cary sub stage of the last glaciation, during which the ice cap extended as far south as Long Island. He could have been in the Southeast during or prior to Cary times, but so far there is no direct, as opposed to inferential, evidence for this. Possibly, he followed the receding Cary ice north into southeastern New York; but the diagnostic fluted points are found as far north as the St. Lawrence Valley and extreme southern Ontario, outside the limits of the later Valders ice (see Ritchie, 1957; 1965, fig. 2).

Provenience data for scattered fluted points and two components, Potts and Reagen, demonstrate the presence of Early Man within the maximum boundaries of proglacial Lake Iroquois and the Champlain Sea, which have been radiocarbon dated at about 9000 B.C. The West Athens Hill and Kings Road sites are well within the limits of late glacial Lake Albany into which drained Lake Iroquois (a late glacial stage of Lake Ontario) via the Mohawk Valley (Ritchie, 1969, fig. 2). The distribution of a number of fluted points, and the Potts site itself, on or near the shores of Lake Ontario, indicates their coevality with the final stages of the Lake, which settled into its present basin by about 8000 B.C.

The Debert site, Nova Scotia, was probably occupied at a time when the Valders margin was within 60 miles of the site (MacDonald, 1968). The average of 13 C-14 dates for Debert hearths is 8635 B.C. The only other date available for northeastern Paleo-Indian is 7000 B.C., an average for several samples from the Bull Brook site (Byers, 1959). This reading has been questioned by a number of writers. MacDonald believes the true age of Bull Brook to be close to that for Debert.

Early Man was able to adapt to a great variety of external conditions following his arrival in the New World, through the close adjustment of his culture to the possibilities of the late-glacial environment. C. Vance Haynes (1964) and others have suggested that the Paleo-Indians, after reaching Alaska from Siberia via a land bridge, were able to migrate southward to the Great Plains through a corridor in the late Wisconsin ice cap which was open about 12,000-12,500 years ago. While some Early Hunters became adjusted to pluvial conditions in the Southwest and other areas, others apparently retained an ancient predilection for a periglacial habitat in the northern United States and some adjoining parts of Canada. Apparently no perceptible modifications in material culture show up as a result of adjustment to the differing environmental milieus.

The Paleo-Indians made effective use of available resources within the limitations of their technology. The best local flints or other tractable stones were sought for the weapons and tools which were the very basis for their livelihood; they depended on large game animals for the bulk of their sustenance, and doubtless for skin clothing and bone implements also; their choice of settlement locations was determined by a number of interacting factors, the most crucial being proximity to game resources.

The environment to which the northeastern Early Hunters had to adjust was a cold and wet one. The ground throughout much of the area was probably frozen for a good part of the year; permafrost conditions prevailed within 100 or more miles of the Valders ice front, as at Debert. Large mammals such as mastodon, mammoth, caribou, elk, horse, and moose were widely distributed until about 8000 B.C., after which certain species became extinct (Hester, 1960). Unfortunately, to date no kill sites like those of the American Southwest have yet come to light in the East.

The vegetation within two or three hundred miles of the glacier would have consisted of a park-tundra: open unforested terrain with numerous bogs, covered by grasses, mosses, lichens, and other small, hardy plants, alternating with clumps or groves of conifers, dwarf willows, and other trees. This environment would have had a high carrying capacity for large mammals. (Butzer, 1964, pp. 138, 145; Fitting, 1966, pp. 120-124.) At increasing distances from the ice front, park-tundra graded into boreal forest.

MacDonald (1968) presents strong evidence for the inference that the Debert site was strategically situated with respect to routes of migration for caribou herds, and draws ethnographic parallels with the modern Montaignais-Naskapi caribou hunters.
The caribou was distributed south of its present range in late glacial and early postglacial times, occurring as far south as Kentucky and as far west as Michigan (Fisher, 1955; Guilday, et-al., 1966; Guilday, 1967; 1968; Fitting, 1966). In 1966 caribou bones were recovered from the same basal occupation zone as a Cumberland fluted point in the Dutchess Quarry Cave, Orange County, New York (Guilday, 1967; 1968; Funk, et al., 1965; 1969). Archaic and Late Woodland artifacts were found in higher levels of this relatively unproductive, but important site, excavated by the Orange County chapter, NYSSA. Apart from the latter instance, no probable associations of fluted points with early faunal remains have been reported for the Northeast, or, for that matter, in the Southeast. It should also be added that the fluted point from Dutchess Quarry Cave is the first to be reported from a northeastern cave or rock shelter.

There appear to be more than one stage or level of development within the Paleo-Indian tradition in the East. The earliest stage would be similar in many respects to the western Clovis material, and would be represented by the bulk of the northeastern data, including West Athens Hill, Kings Road, Potts, Bull Brook, Shoop, and Debert. It may prove feasible to subdivide this stage into more than one level, as proposed by Witthoft (1952) and MacDonald (1968). The closing phases would comprise manifestations on the order of Reagen and scattered finds of Plano points (Ritchie, 1965, pp. 16-18; Funk and Schambach, 1964). Much more information on regional variation and chronology is needed to delineate the evolution of northeastern Paleo-Indian culture.

Ritchie (1957, p. 7; 1965, p. 7) has pointed out the preference of Early Man for elevated site locations, but has noted that many fluted point find-spots and a number of the known habitation sites are at relatively low elevations. The West Athens Hill, Reagen, Shoop, and Williamson (McCary, 1951) sites are all on rather prominent ridges. The Davis site occupies a high terrace on Lake Champlain. The Potts site lies on a low, long drumlin; Bull Brook covers a low sandy terrace; Debert is situated on a large, broad, but low rise; and the Kings Road station has an isolated position in the middle of extensive clay flats.

In the case of West Athens Hill, the outcrops of high-grade flint were obviously an important determinant of the site location, but, as will presently be discussed in more detail, the high summit also afforded an excellent vantage point for observing the movements of game in adjoining valleys. The latter factor seems to have been the major consideration in the Early Hunters' choice of the Reagen, Shoop, and Williamson sites. Where rather low elevations are involved, we are forced to the conclusion that convenience to game was the all-important deciding circumstance; almost any dry, well-drained location above river flood plains would have served the purpose of a camp site.

We would suggest that both West Athens Hill and the Kings Road site were selected by the Early Hunters because they were favorably located with respect to concentrations of game animals, which in turn were affected by the local geography. Study of the site locations and their surroundings on a Coxsackie 15 minute U.S.G.S. topographic quadrangle elicits several interesting observations. Running north to south on the left-hand side of the map is the high, steep Helderberg escarpment, composed of a series of Silurian and Devonian limestones (Goldring, 1943). Behind the escarpment, that is, to the west of it, the terrain is fairly uneven, varying from occasional rugged knolls and ridges to rolling meadows, level boulder fields, and swamps. The lowlands east of the scarp, which average two to three miles in width, adjoin the Hudson River; the predominant gently rolling countryside is broken by rises and ridges of shale generally of low elevation, and trending north to south.

More or less centered on the quad sheet are some striking features. West Athens Hill is situated near the southern end of a long outcrop of Normanskill shale which, due to considerable variation in height above the adjacent clay flats, is considered to be divided into a series of linked ridges, oriented north and south. Five miles to the north and just to the east is Flint Mine Hill.
Between the ridge bearing West Athens Hill and the Helderberg escarpment is the fairly flat valley of the Hans Vosen Kill, which drains south into the Catskill; this valley is five miles long and averages 500 yards in width. On the east side of the ridge is the Athens Flat, which is about five miles long and one mile wide. At the northern extremity of the ridge four miles north of the site the Flat and the slightly hilly headwater end of the Hans Vosen Kill valley merge; the level ground continues northward around both sides of Flint Mine Hill, extending almost to the Hudson River at Coxsackie, and terminating just south of Hannacroix.

On the south, the Athens Flat ends about one mile north of the Catskill, south of which point the terrain between the river and the Helderberg becomes relatively more uneven, sometimes rugged. North to Albany, the topography east of the Helderbergs is only moderately hilly and broken by such streams as Hannacroix Creek, Onesquethaw Creek, Vloman Kill, and the Normanskill.

On the assumption that the late glacial environment in Greene County could be described as park-tundra, we hypothesize that the open, level, easily traversed areas of Greene County just described would have been attractive to big game. Grasses, lichens, mosses, and shrubs would have provided ample food for grazing animals, while clumps of dwarf willows, spruces, and other trees would have been ideal for browsers. Animals moving north or south through this region of the Hudson Valley would have found the going rough west of the Helderbergs and in the Catskill Mountains; those closer to the river would have been "penned" in a large natural corral by the lengthy escarpment. In any case, the path of least resistance would have been within two to three miles of the river.

The flats could have been entered from the south by fording the Catskill, which during the summer is very low, exposing large bedrock shelves. To the north, several fair sized but shallow tributaries would have to be crossed before reaching the Mohawk River.

Seasonal movements of such extant Canadian-sub arctic herbivores as caribou and musk-ox are known to take place. We suggest that Pleistocene genera, including caribou, moose, elk, bison, horse, mastodon and mammoth, tended to concentrate in the Greene County flats, and migrated seasonally back and forth from north to south. Further, we suggest that Early Man located his settlements in such a manner as to take advantage of the ecological situation.

A number of finds of Pleistocene mammals have been made in Greene County and in adjacent Albany County. These include five mastodons, one bison, two horses, and two deer (Ritchie, 1965, fig. 3). It will further be noted that such discoveries are extremely rare in the Catskill Mountains. Numerous skeletons or skeletal parts have been recovered in Orange County and immediately surrounding areas of Sullivan and Ulster counties; on the west side of the Hudson between the Ulster-Orange border and northern Greene County similar finds are lacking. Other finds have been made in Westchester, Dutchess, and Columbia counties. From Orange County north, all Pleistocene remains have been located on or near the river.

Thus it seems likely that West Athens Hill and the Kings Road site were favorably located with regard to areas of concentration of big game. West Athens Hill was selected as a camp not only for abundant flint veins, but also for its commanding view of the broadest part of the Hans Vosen Kill valley, to the west, and the Athens Flat, to the east. The site is on the highest part of the long ridge, which may explain why no similar sites have been found on other areas of the ridge, despite intensive search by various persons. Under forested conditions, the view from the hilltop would have been obstructed, making it useful only as a quarry. In this event, it is likely that the habitation site would have been located elsewhere.

Migrating gregarious species, including horse, caribou, and bison, would have passed close to the hill on both sides. The Kings Road station lies near the middle of the northern portion of Athens Flat, where game could easily be intercepted. Possibly, the nearby swale was a watering hole under late glacial climatic conditions.
It might be suspected that, given the data so far adduced, more Paleo-Indian sites should be found along the north-south aligned flats. As if in support of this hypothesis, considered for some time by the senior author, another Early Hunter component was discovered in 1967 near West Athens Hill by John H. McCashion of the Van Epps-Hartley Chapter, NYSAA. Several side scrapers and an end scraper of indubitable Paleo-Indian origin were collected by McCashion from a large workshop, designated the Railroad site. Three fluted points have previously been reported by Ritchie (1957) as coming from the vicinity of Flint Mine Hill.

A number of questions remain to be asked about the technology and settlement patterns of Early Hunters in New York State. Some hypotheses can be proposed for "answers."

As recognized by most authorities, the simple tool kit of Early Man was directed to the killing and butchering of game, the processing of hides, and the working of wood, bone, antler, and ivory; but there has been considerable diversity in the functions attributed to various tool forms.

We have presented evidence that the ubiquitous end scrapers and side scrapers of New York Paleo-Indian assemblages functioned in the shaping of hard substances such as wood and bone. There is no evidence that they were used for processing animal skins, as at Debert (MacDonald, 1968) or in the U.S.S.R. (Semenov, 1964). It is hard to evaluate this disparity, but it may have far-reaching implications. Presumably, the groups at Debert and in the Hudson Valley were relying on the same game animals, and had a similar need for skin clothing, despite possible regional differences in climate. The Hudson Valley bands may have used bone tools for hide-working; what did the occupants of Debert use for making dart shafts and bone implements?

We have also shown that the biface knives from Potts, Kings Road, and West Athens Hill evince patterns of wear identical with those on the meat knives studied by Semenov.

The rough stone tools at West Athens Hill and Kings Road are unique in the northeastern United States, but a similar series of hammerstones, abrading-stones and anvil-stones occurred at Debert.

Hammerstones were obviously used for flint-quarrying at West Athens Hill, and as chipping tools there and at the other sites. The abraders may have served to grind the lateral edges of points, and to sharpen bone awls. Anvil-stones could have been used for several operations, including flint-knapping and the breaking of bones to extract marrow.

The great majority of tools on the Greene County sites were manufactured from locally available stones. Sandstone from outcrops, and quartzite or gneissic cobbles from till, used for rough stone items, were readily obtained and were discarded on breaking camp. Normanskill flint was abundant, hence considerable wastage on both sites.

However, a significant percentage of end scrapers from both sites, and a small number of other tools, were manufactured from Pennsylvania jasper and other exotic materials. Little or nodebitage of these materials is found on the sites. The small quantity of maroon jasper flakes found at the Kings Road site pertains almost entirely to a jasper derived from the Lake Champlain region or northern New England. There are a very few small flakes of Pennsylvania jasper, apparently from re-sharpening of scrapers.

Why the high frequency of exotic stones in end scrapers, as opposed to other tool types? We would hazard the following hypothesis. Exotic materials, however acquired, were probably used during distant sojourns for all classes of artifacts. As time went on, and the band moved farther and farther away from the sources of the materials, toward the Hudson Valley stations, many of the artifacts of exotic stones would be lost through normal attrition, and be replaced by using locally obtainable stones. But certain items would tend to be recirculated in the tool kit, especially those prized because of their high utility and the relatively great amount of effort devoted to their production. Thus, end scrapers were second only to fluted points in requiring careful shaping and retouch; as previously suggested, they may also have been hafted. Side scrapers required less deliberate chipping, and were probably held in the hand.
The end scrapers were perhaps carried long distances by the hunter in a pouch, and used until they could no longer be resharpened. Side scrapers were easier to make, and more readily discarded; hence the lower frequency of exotic pieces, as contrasted to end scrapers. Fluted points were frequently lost or broken in the pursuit of game, so that as the band moved farther from the source of exotic stone, more and more points were made of local, as opposed to exotic, materials.

Ritchie (1957; 1965, p. 9) has suggested, largely on the basis of the distribution of Pennsylvania lithic materials in upstate New York, and of New York materials in Pennsylvania, that Early Man migrated northward into what is now New York during warm months, and southward into Pennsylvania and other states in cold months. With him (Ritchie, 1969, p. xvii) we postulate that these movements were tied to the migratory patterns of big game. On the southern leg of its travels, a Paleo-hunter band, carrying tools of New York flints, would obtain some jasper, perhaps by trade with other groups. On the northern swing the jasper, carried as finished artifacts, would be progressively used up, while New York flints would be acquired wherever available. While materials exotic to a given locality would usually be of minor importance in a given assemblage, some sites would feature a predominance of such materials. Sites of this kind, as at Shoop's (Witthoft, 1952), where western New York Onondaga flint heavily predominates, may represent first stops in a region by a group coming from a considerable distance.

We visualize the West Athens Hill and Kings Road sites as occupied by small bands who had roved over considerable areas in New York State and surrounding territories preying on big game. While making use of local Hudson Valley flints for most of their artifacts, they bore mementos of their earlier travels in the form of non-local stones. In size and composition they probably conformed to the patrilocal bands described by Service (1962), to judge from what is known of component size, technological level and subsistence economy.

In view of the small area covered by the Kings Road site, its isolated, non-distinctive location, and the relatively small variety of non-local materials in the collection, we believe it highly probable that the site represents a single component, i.e., one occupation by a single Paleo-Indian band. With the exception of the side scraper fashioned from Flint Ridge chalcedony, all of the exotic stones could have been acquired by one group moving along a north-south route between Pennsylvania and the central Hudson Valley and, perhaps, the Lake Champlain-northern Vermont area.

On the other hand, West Athens Hill is not only a larger site, with a prime attraction in its high elevation and its flint veins, it features a greater diversity of foreign stones; western New York Onondaga flint, Oriskany flint, Upper Mercer, Ohio, flint and other items all have their sources in different directions, and at varying distances, from the site. Thus it appears probable that West Athens Hill was occupied at more than one time, by more than one band of Early Hunters. They may have arrived on the spot after sojourning in such far-removed places as Ohio, western New York, and eastern Pennsylvania.

It seems less likely that the non-local stones were acquired in trade by local groups attached to their own territories, participating in far-flung networks of communication. Yet something of this sort has been proposed by Fitting (1966), who has demonstrated the existence of stylistic variability among late Paleo-Indian groups in Michigan and adjoining areas. In his words, "The interpretation I would favor for the artifact distribution which we have observed would be that of similar peoples occupying contiguous territories. The artifacts of these groups would be similar with a preference for local raw materials." He carries the idea to higher levels of interpretation: "These groups would be in contact with each other and marriage and trade probably took place between them. This would account for the slight overlap of raw materials in both the Michigan and Ohio sites." (Ibid., p. 128.)

Fitting goes on to suggest that the Paleo-Indian bands moved within relatively small territories of 200 square miles.
We do not propose that a well-defined territoriality obtained for the Early Hunters in New York. Nevertheless, we feel that the clues of exotic lithic materials do not have to be read in terms of free wandering or seasonal migrations covering hundreds of miles. Rather, there were restrictions imposed on the movements of bands by their physical limitations, by topography, climate, and the patterns of distribution of food animals. Within a loosely conceived territory, a given band might, for example, travel from the Hudson Valley to central New York, where it would encounter another band resident in the general area (e.g., the band which occupied the Potts site). Ideas, lithic materials, and women might be exchanged. Among materials obtained from the central New York band might be some items of Ohio flints. Something similar may have happened between groups centered in the Hudson Valley and eastern Pennsylvania. The result; a predominance of local stones in a given assemblage.

The outstanding case against this model is the Shoop site, with its preponderance of western Onondaga flint. This example only goes to show that it is risky to impose a rigid model on the problem. A variety of circumstances, including annual and seasonal fluctuations in climate, variation in the quantity and distribution of available food, chance meetings with other bands, etc., must be assumed to have influenced the movements of Paleo-Indian groups.

REFERENCES

Butzer, Karl W.
1964  *Environment and Archaeology.*  Aldine Press, Chicago

Byers, Douglas S.

Fisher, Donald W.

Fitting, James E.

Funk, Robert E.
n.d.  *Recent Contributions to Hudson Valley Prehistory.*  MS.


Goldring, Winifred

Guilday, John E.

Lawrence, H. W. Hamilton, and A. D. McCrady

Haynes, C. Vance, Jr.

Hester, Jim J.

MacDonald, George F.

McCary, Ben C.

Parker, Arthur C.

Ritchie, William A.

Schambach, Frank F.
1966 An Archaeological Site and Collection Survey in the Hudson North Quadrangle. Senior Project submitted to the Division of Social Studies, Bard College. MS.
Semenov, S. A.

Service, Elman R.

Witthoft, John
Dutchess Quarry Cave is 1.5 mi. north of Florida, Orange County, New York (lat. 41° 21' N.; long. 74° 22' W.; alt. 500', Warwick, N.Y. quadrangle, U.S.G.S. 72’ series). The cave is on the northwest face of 660 ft. high Mt. Lockout, about 100 ft. above the surface of a now drained bog, formerly known as the "Drowned Lands." Its location commands a wide view to the north and south and, were it not for the unfortunate fact that its mouth faced into the prevailing wind and storm paths, it would have made an ideal station from which to mount a game watch. It was apparently never heavily occupied, but the stone projectile points apparently span most of the history of prehistoric man in the area. Although the upper levels of the deposit contained much refuse bone and Levanna type triangular arrowpoints interpreted as a Woodland occupation (Funk, Walters, and Ehlers, 1965), it is significant that no ceramics were found in the entire deposit. This is strong presumptive evidence that the site was used only by itinerant parties, at least in the closing phases of aboriginal occupation.

The variety of animals identified from the site is misleading archaeologically. Rockshelters and small caves afford shelter to many forms of life other than man and it is inevitable that their remains would be incorporated into the deposit independently through burrowing or denning activities, as the result of birds of prey roosting and littering the aggrading shelter floor with small mammal debris, or due to the collecting activities of resident wood rats.

**Description of Site**

Dutchess Quarry Cave is a deep horizontal fissure in limestone. The cave is about 20 ft. wide at the mouth, narrowing rapidly towards the back, about 65 ft. from the entrance. Before excavation the cave was almost completely choked with rockfalls. In a preliminary paper on the excavation, Funk et al. (1965, p. 3) discuss the stratigraphic picture: "Only a rough physical stratigraphy is to be found at the site. The principal artifact bearing zone, stratum 1, consists of dark brown earth and heavy rubble. It is about 7 ft. thick at the cave mouth, diminishing to a few inches at a point some 30 ft. inside the chamber. Scattered through the zone are occasional artifacts, animal bones, mussel shells, and tiny specks of charcoal. The underlying stratum 2 is made up of white earth and rockfalls. The earthy constituent, often powdery, is apparently calcite, with certain minor ingredients. In its upper few inches, stratum 2 contains occasional bits of refuse bone and, rarely, artifacts. In some places, the lower part of the deposit is a hard crust. Below stratum 2 tests revealed yellow clay containing some rounded pebbles."

Twenty-five species of mammals, eight species of birds, four reptiles, two amphibians and three species of fish were represented in the bone refuse from the cave. All of them, with the striking exception of the caribou (*Rangifer tarandus*) are, or were until European colonization, characteristic of the region as it is today. In addition to vertebrates there were two species of land snail (*Triodopsis* and *Anguispira*), a few freshwater clam shells and one complete oyster shell (*Ostrea*). The oyster shell, found on the talus slope of stratum 1, as well as a single pig rostral bone from test square no. 1 and a partial horse ilium of unknown provenience are of recent origin. Many of the small mammals may either have been contemporaneous with the aboriginal occupation or have post-dated it. The wood rats were undoubtedly a resident population and many other species of mammals, or birds of prey, or snakes may have lived in the cave at one time or another. The presence of the big brown bat (*Eptesicus fuscus*) is interesting in that this species is one of the
hardiest of the bats of eastern North America and would be the only species of bat that might reasonably be expected to hibernate in such a shallow, exposed cave. The large number of small mice (*Microtus pennsylvanicus*, *Pitymys pinetorum*, and *Synaptomys cooperi*) probably reflect hunting of adjacent grassy areas by owls. The undigested bones and fur of owl prey is regurgitated daily at the roost.

The presence of caribou (*Rangifer tarandus*) bones, teeth, and antler fragments came as a distinct surprise. Orange County is in the southeastern corner of the state approximately 300 mi. south of the caribou's known historic range in northern Vermont and Maine. Caribou and white-tailed deer are allopatric in distribution, deer in primarily deciduous forest, replaced to the north by caribou in coniferous forest/barren ground situations, although Erskine reports both species from prehistoric sites in Nova Scotia (Erskine, 1961, 1962). Since the caribou remains from Dutchess Quarry Cave seem to have been confined, with one exception, to the underlying stratum 2, and deer remains to the upper stratum, it appears quite probable that deer replaced caribou as a result of post-Pleistocene climatic amelioration. The change from boreal to temperate conditions was a relatively rapid one and believed to have been completed in central Pennsylvania at approximately the same latitude by 7,000 B.C. (Guilday, 1967). Pleistocene caribou remains are known from as far south as southeastern Pennsylvania (Guilday *et al.*, 1966), Kentucky (Schultz, Tanner, *et al.*, 1963), and Virginia (Ray, *et al.*, 1967), none in association with man but in association with an extinct fauna. To my knowledge, *Rangifer* remains have been reported in but one other site in association with early man south of their present distribution—a single toe bone from the Holcombe Beach Site in southeastern Michigan. Its age was estimated by a beach of glacial Lake Algonquin at about 9,200 B.C. (Cleland, 1965). Caribou remains from New York State were summarized by Fisher and Ostrom, 1952. They record five finds, four antlers and a "jaw," all buried in glacial gravels or in peat deposits that mark the sites of former post-glacial lakes, including an 1845 account of "a horn" from a marl pit in Scotchtown, Orange County.

Caribou remains, as well as those of moose (*Alces alces*), have also been reported from a shellheap (kitchen midden) less than a mile inland from Plymouth Bay at Duxbury, Plymouth County, southeastern Massachusetts; lat. 42° 2' N; long. 70° 37' W. They were excavated in 1961 by the Massachusetts Archaeological Society and were identified by Dr. Joseph H. Waters, Villanova University, to whom I am indebted for this record. Associated with projectile points and ceramics characterized as "Middle Woodland," the estimated age is 2000 years or less. The Duxbury site may indicate a relatively recent southern range extension of *Rangifer* along the northeastern seaboard.

The presence of caribou limb bones that appear to have been broken for marrow in the Dutchess Quarry cave in the same basal stratum as a Cumberland fluted point is strong presumptive evidence for a primary association of Paleo-Indian and caribou in southeastern New York. Many studies of aboriginal sites ranging from early Colonial through Archaic have indicated that the accompanying bone refuse has invariably been composed of only those species of animals that would inhabit the area today, given the absence of European colonization.

It seems strange that there is no other species of boreal affinities from stratum 2. The presence of the southern flying squirrel, woodrat, pine mouse, elk, passenger pigeon, and turtles from stratum 2 seems incompatible with the presence of caribou. It is highly probable that burrowing activities of hibernating snakes and rodents, or digging activities of man may have resulted in many bones filtering down into lower levels. It is much harder to filter up however, and the rare occurrence of these forms in these lower levels is not as disturbing as it may appear at first sight. The high concentration of caribou remains in the lower stratum appears much more significant.

Unfortunately, the amount of caribou bone recovered was insufficient for a C-14 test. Pollen analyses of the matrix and material removed from the marrow cavity of a caribou
radius was negative. Pollen was apparently destroyed by oxidation or abrasion. A fluorine analysis by Joseph Ryan of Harbison-Walker Research Laboratories of both deer and caribou bone was inconclusive. Fluorine content of bones of both species was low (Rangifer, 0.30%-0.31%; Odocoileus, 0.27%-0.31%, 0.39%-0.44%). If the caribou bone was appreciably older, as we suspect, it should show an increase in fluorine content as a result. Perhaps the time interval, a few thousand years at best, was too short to register an appreciable increase in what may have been a relatively cold dry episode.

All we are left with is the circumstantial evidence of the excavation, but there is no good reason for doubting a primary association between the fluted point and the caribou refuse bones. Dutchess Quarry Cave would appear, therefore, to be the first reported find, albeit an extremely meager and transient one, of a Paleo-Indian site in eastern United States yielding food bone. The alternate suggestion that the Cumberland point was picked up and used by later cultures who then introduced it into the cave seems rather a tenuous one.

Although many of the caribou remains were from unrecorded depths in the midden, 1 upper premolar, three fragments of what may be the same radius/ulna were recovered from stratum 2, 10 ft. from the mouth of the cave at a depth of 7 ft.; 1 second phalange and 1 right radius/ulna (of which two fragments were recovered) from "general stratum no. 1" although it is obvious from their coloration and adhering matrix that they derived originally from the underlying stratum; 1 fragment of a cannon bone from 10 to 20 ft. from the cave mouth at an unspecified depth; 1 broken antler and 2 first phalanges from 13 ft. from the mouth of the cave, 5 ft. left of baseline and 5 ft. 6 in. deep in stratum 2; lastly, 1 right os magnum 14 ft. back from the cave mouth, 3 ft. to the left of baseline and at a depth of 4 ft. 4 in. from the surface. In summary of the 12 items positively identified as caribou, eight came from the underlying stratum 2 and four are of unknown provenience but appear to have been derived from stratum 2.

Of the 26 fragments identified as deer, only one is recorded as being from stratum 2 (14 ft. from mouth of cave, 5 ft. left of baseline at a depth of 4 ft. 9 in.). The remaining 25 were either from stratum 1 or surface finds or unspecified.

ACKNOWLEDGMENTS

I would like to thank William F. Ehlers and George Walters of the Orange County Chapter of the New York State Archeological Association, Dr. Robert E. Funk and Dr. Edgar M. Reilly, Jr., New York State Museum, Miss Eleanor Adam and Donald P. Tanner, Carnegie Museum, and Sigfus Olafson for their help. The bird bones were identified by Dr. Paul W. Parmalee, Assistant Director, Illinois State Museum. All bone material, including the caribou remains, is in the New York State Museum at Albany. The study was supported by National Science Foundation Grant GB-3083.
Provenience Data: Deer, Caribou, Elk Bone Refuse, Dutchess Quarry Cave

<table>
<thead>
<tr>
<th>Test square no. 1</th>
<th>Caribou</th>
<th>Deer</th>
<th>Elk</th>
</tr>
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<tbody>
<tr>
<td>General stratum no. 1</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Stratum 1, above fluted point</td>
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<td>x</td>
<td></td>
</tr>
<tr>
<td>Stratum 1, talus slope</td>
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<td></td>
</tr>
<tr>
<td>Stratum 1 (brown), front talus, 10'-8'</td>
<td>x</td>
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</tr>
<tr>
<td>Stratum 1, BL 10'-8', 8' deep</td>
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</tr>
<tr>
<td>Talus general</td>
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</tr>
<tr>
<td>Stratum 1, outside talus slope, general</td>
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</tr>
<tr>
<td>Stratum 1, general</td>
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<td>x</td>
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</tr>
<tr>
<td>Stratum 1, BL 24'-26', 2-3' right, 15-28'' deep</td>
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</tr>
<tr>
<td>Stratum 1, BL 8', 6.5'' deep</td>
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</tr>
<tr>
<td>Surface find-35', cut from limestone boulder</td>
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<tr>
<td>Stratum 1, BL 25', 2' left, 1' 10'' deep</td>
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</tr>
<tr>
<td>Stratum 1, BL 0-2', left side, 10-11' deep from ceiling</td>
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</tr>
<tr>
<td>Stratum 1, BL 15-20', 6-12'' below datum</td>
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</tr>
<tr>
<td>Surface, general</td>
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</tr>
<tr>
<td>Surface, BL 10'</td>
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</tr>
<tr>
<td>Stratum 1, BL 15-20', 3' deep</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stratum 2, BL 10', left and right, 7' deep</td>
<td>x</td>
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<td></td>
</tr>
<tr>
<td>Stratum 2, BL 13', 5' left, 60-66'' deep</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stratum 2, BL 14', 4' left, 4'4'' deep</td>
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</tr>
<tr>
<td>Stratum 2, BL 14', 5' left, 4' 5'' deep</td>
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<td></td>
</tr>
<tr>
<td>Stratum 2, BL 20-22', right</td>
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</tr>
<tr>
<td>Stratum 2, BL 21', 7' 8'' below ceiling</td>
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Faunal List, Dutchess Quarry Cave, Orange County, New York

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<th>Species</th>
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<td><strong>MAMMALS</strong></td>
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<td>Blarina brevicauda, short-tailed shrew</td>
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<tr>
<td>Eptesicus fuscus, big brown bat</td>
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<td>3</td>
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<tr>
<td>Maronota monax, woodchuck</td>
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<td>Sciurus carolinensis, gray squirrel</td>
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<td>Glaucomys volans, flying squirrel</td>
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<td>Tamias striatus, chipmunk</td>
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<td>Neotoma floridana, woodrat</td>
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<td>Synaptomys cooperi, southern bog lemming</td>
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<td>Pitymys pinetorum, pine mouse</td>
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<td>Microtus pennsylvanicus, meadow mouse</td>
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<td>Ondatra zibethicus, muskrat</td>
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<td>Sylviulus species?, cottontail rabbit</td>
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<td>Ursus americanus, black bear</td>
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<td>Procyon lotor, raccoon</td>
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<td>Urocyon cinereonargicus, gray fox</td>
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<td>Canis domesticus, dog</td>
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<td>Mephitis mephitis, striped skunk</td>
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<td>Mustela frenata, long-tailed weasel</td>
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<td>Lynx rufus, bobcat</td>
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<tr>
<td>Cervus canadensis, elk</td>
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<tr>
<td>Odocoileus virginianus, white-tailed deer</td>
<td>21</td>
<td>3</td>
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<tr>
<td>Rangifer tarandus, caribou</td>
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<tr>
<td>Sus scrofa, domestic pig</td>
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<tr>
<td>Equus caballus, horse</td>
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<td><strong>BIRDS</strong></td>
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<td>Ectopistes migratorius, passenger pigeon</td>
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<tr>
<td>Strix varia, barred owl</td>
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<td>Buteo jamaicensis, red-tailed hawk</td>
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Faunal List, Dutchess Quarry Cave, Orange County, New York (continued)

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<th>Species</th>
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<tr>
<td><strong>REPTILES</strong></td>
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<td>Terrapene carolinensis, box turtle</td>
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<td>Chelydra serpentina, snapping turtle</td>
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<td>Crotalus horridus, rattlesnake</td>
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<tr>
<td><strong>AMPHIBIANS</strong></td>
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<td>Rana, species?, small frog</td>
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<td>Rana catesbiana, bullfrog</td>
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<tr>
<td><strong>FISH</strong></td>
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<td>Catostomus, species?, sucker</td>
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<td>Amiaurus, species?, catfish</td>
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</tr>
<tr>
<td>Acipenser, species?, sturgeon</td>
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</tbody>
</table>

*The figures above do not necessarily refer to total numbers of fragments or of individuals. They refer to the presence or absence of bones of individual species from various bagged lots of bone as they were received in the laboratory. They do, however, yield some approximation of the relative abundance.

**REFERENCES**

Cleland, Charles E.

Erskine, J. S.

Fisher, Donald W. and John H. Ostern

Funk, Robert E., George Walters, and William F. Ehlers

Guilday, John E.

Ray, Clayton E., Byron W. Cooper, and William S. Benninghoff

Schultz, C. Bertrand, Lloyd G. Tanner, Frank C. Whitmore, Jr., Louis L. Ray, and Ellis C. Crawford