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One hot summer's day in 1947, while surface-hunting on one of the numerous plowed fields along the Delaware River in northern New Jersey, a few miles below Port Jervis, New York, I had the good fortune of making one of those finds archaeologists dream about. This whole area as far south as Delaware Water Gap was formerly occupied by the Munsee. Following a north-south furrow that led up to a little knoll, I found a light reddish-brown sherd about the size of the palm of a hand. Then further along, I picked up several more. They were about 3/8 of an inch in thickness and had the same surface finish.

It was easy to see that these pieces came from a large pot and that more of the pot must be somewhere close by as the sherds were still fresh. Evidently the farmer in plowing or harrowing had struck the pot itself, bringing the fragments to the surface.

Immediately, I started probing with the trowel hoping to hit something hard. But no such thing occurred although I searched over an area roughly 15 feet by 50 feet, both up and down the hill. Somewhat disappointed, I decided to give up and headed for my boat with which I had come up the river. But something - some inner voice - prompted me to go back over again. So I started pushing the trowel into the soft sandy earth a little closer to the top of the rise from where I had left off before. Almost at once I struck something besides loose earth. Getting down on hands and knees, I soon exposed what I thought was a large sherd about 7 inches below the surface. But this large sherds soon proved to be the complete circumference of a pot. After brushing off the dirt, jagged edges with fresh breaks soon told me where the pieces I had found on the surface had come from. That was more than thrilled, you can well imagine.

Now I began removing the sand around the outside of the vessel in order to get it out of the ground. But I had not reckoned with its size. After digging a hole 20 inches deep around the entire urn, I still could not judge it even a trifle. That made me decide to remove the earth from the inside. Surprisingly only a few smaller sherds were recovered on the outside. Proceeding carefully with brush and grape fruit knife, I soon exposed a large stone that was lodged snuggly inside of the pot. An eighth of an inch crack on both sides of my lucky find made the work more difficult and extreme care was necessary to avoid any further damage. Therefore tied a strong cord around the vessel.

The stone when finally removed measured 9 1/4" x 12 3/8" x 23" and looked somewhat like a flat mortar. Progress was easier now and I soon had a regular pile of large and small sherds, including a large bottom sherd.

By this time, I was wringing wet from anxiety and excitement in spite of working only in shorts, having previously discarded my wool shirt and khaki trousers. So I decided to take time out and cool off a bit by having a smoke and placing the larger sherds in cellophane bags. These I placed in the shade close to my boat.

Returning now to the ticklish task of removing the main part of the pot from the excavation, I enlarged the hole and deepened it to 56 inches. Here is where I got another surprise for I found out that the vessel had been placed in the ground with the rim or open end at the bottom of the hole. And what a beautiful decorated neck and flaring rim it was! My guess was Castle Creek Focus-Owasco Aspect!

After the inside had been carefully cleaned of all dirt and sand, I finally was able to tilt it a bit. But how was I to lift it without having the whole thing collapse on me? It surely weighed more than 25 lbs. Should I go home for assistance and in the meantime have someone else stumble on my find, just about ready for removal? Rather than take that chance, I decided to do the job myself.

I reinforced the vessel by wrapping my khaki pants around the outside and then winding my boat rope around this. Then I slipped my wool shirt under the pot to give it more support. Now very carefully, I raised it and carried it over to my boat. What a relief to have that over with! Returning to the hole, I troweled around for anything that may have been in or under the pot. Aside from a small stone and a few jaw fragments of some small mammal, nothing else was found. There was neither organic matter nor charcoal as are usually found in New Jersey pits unless this one was so shallow that continuous plowing and erosion had removed all such traces.

After filling back the hole and taking measurements in order to locate the place again, I carefully stowed away my findings and headed for home; luckily down the river and with the least of effort.

It was not until I got there and tried to assemble the various pieces, that I realized how fortunate I had been. Not only had I found about 90% of the vessel but the upper two-thirds was entire and in one piece. Neck and rim were complete and almost perfect.
It is extremely difficult to figure out how any aboriginal woman could have molded such a large and beautiful container with only the most primitive of tools at her disposal.

The fine workmanship could only be appreciated after the damp sand adhering to the upper part and the sherds was removed.

My opinion is that the large stone found in the pot was used to "kill" it and the side and bottom sherds deliberately placed within. Otherwise more sherds would have been found on the outside.

Roy Morse and I spent at least one or two nights a week for several months trying to find some way to get the bottom part connected to that of the top. It was just this middle section that had been sheared off by the plow. There was really only one connecting sherd that tied the lower part to the upper one.

Finally, William S. Fowler of the Attleboro Museum was kind enough to offer his assistance. We are most grateful to him that we now have the pot reconstructed. His skill, perseverance and patience made a show piece out of what looked like a hopeless problem to us. He has furnished an illustration to show decoration and construction and has kindly offered the following description and remarks concerning this urn.

Probably belongs to Ritchie's Castle Creek-Owasco Aspect.

Description

Small semi-globular base; deep constricted neck with walls varying from 1/2 to 1/4 inch; 17" diameter mouth with total depth of vessel, 27"; out-flaring rim, flattened and highly decorated; mineral temper with no coiling indicated; exterior is apparently maleated by a corn filled corn cob that has been rolled over the surface; interior is smooth; meticulous decorations, all in dentate technique, cover the outside surface from lip down around shoulders, and also 1/2" down on the inside of lip; decoration consists of oblique dentate lines inside of lip, while on the outside of the lip there is a dentate herringbone motif. A nine-line horizontal band appears in the constriction of neck, situated above large dentate chevrons of nine to ten lines each which extend down over the shoulders. In the center of the flat surface of the lip is a one-line linear dentate, surrounded by dentate maleation.

Fig. 11. Castle Creek - Owasco Ceramic Urn
Upper Delaware River, New Jersey.

Remarks

This vessel from New Jersey shows superior workmanship, not only in its construction, but also in the precise application of the dentate stamp so that all lines are, in general, equidistant. The vessel shows no wear at the base or on any surface and may have been used as a sacrifice in some ceremonial observance. It weighs about 75 pounds and is of a yellow-orange ware that is grayish from vessel's center to its rim, apparently caused by the firing.

May, 1949
North Attleboro, Massachusetts
THE PILGRIMS AS ARCHAEOLOGISTS

Warner F. Gookin

When the Pilgrims landed on Cape Cod toward the end of 1620, on their journeys afield by way of exploration, they dug somewhat naively into graves near Truro. It happens, nevertheless, that the description of these graves found in Mourt's Relation (1) are so explicit that they present an interesting and accurate picture archaeologically of Nauset Indian burial customs confirmed in detail by information about Indian customs obtained from other sources.

Of the first grave examined, for instance, it is related that it was "covered with old mats, and had a wooden thing, like a mortar, whelmed on the top of it." An explanation of these things is supplied by Roger Williams, who in reporting on Narragansett burial customs, remarks that "upon the grave is spread the mat that the party died on, the dish he did eat in." (2) So the mists reported by the Pilgrims were the bed of the deceased and "the wooden thing" that looked to the Pilgrims like a mortar—was his eating bowl.

Although the account expresses some scruples about disturbing these graves, when the Pilgrims came upon a larger and more impressive one, they could not suppress their desire to examine it thoroughly. Their account of it is as follows:

"It was much bigger and longer than any we had seen. It was also covered with boards, so as we mused what it should be, and resolv-ed to dig it up; where we found first a mat, and under that a fair bow, and then another mat, and under that a board about three quarters [of a yard] long, finely carved and painted; with three times or breaches at the top, like a crown. Also between the mats we found bowls, trays, dishes, and such like trinkets. At length we came to a fair new mat, and under that two bundles, the one bigger and the other less. We opened the greater, and found in it a great quantity of fine and perfect red powder, and in it the bones and skull of a man. The skull had fine yellow hair still on it, and some of the flesh unconsumed. There was bound up with it a knife, a pock-needle, and two or three old iron things. It was bound up in a sailor's canvas cassock and a pair of cloth breeches. The red powder was a kind of em-balmment, and yielded a strong, but no offensive smell; it was as fine as any flour. We opened the lesser bundle likewise, and found of the same powder in it, and the bones and head of a little child. About the legs and other parts of it was bound strings and bracelets of fine white beads. There was also by it a little bow, about three quarters [of a yard] long, and some other odd knacks."

The first point to note in this description is the presence of the fine red powder, easily identified as red ochre, a sesquioxide of iron. A powdered red clay would not have remained a powder in a grave permeated by rain water. Furthermore, the oxide of iron in powdered form when moist has an odor that is aptly described as "strong but not offensive," Professor Charles C. Willoughby notes the general use of red ochre in pre-Algonquin graves of northern New England, a possible relationship to the Beothuk of Newfoundland, where it was in common use as a pigment. He makes no mention of its use in southern New England and assumes that the source of the red ochre was outcroppings in the vicinity of the Katahdin Iron Works in central Maine. (3)

The Cape Cod red ochre may well have come from similar outcroppings near the iron deposits of Taunton, Massachusetts, profitably mined by white men for many years. It is possible that the Cape Cod Indians used it because of a descent from coastal Indians further north; but as the Taunton iron is at the center of the Wampanoag country, it would seem likely that the use of red ochre as a pigment for the deceased to take with them into the next life was more general in southern New England than has been supposed. The sandy soil general in these regions would account for its disappearance, as complete oxidation would leave presumably only a stain to be washed down to lower depths. Red ochre has, of course, no "embalment" properties such as the Pilgrims assumed.

The yellow hair adhering to the skull of the corpse has naturally given rise to endless and unrestrained speculation. The explanation, however, would seem to be a very simply one. It was supplied to the writer by his neighbor and friend on Martha's Vineyard, Dr. Albert E. Edel, long attached to the medical examiner's office of the State of New Jersey, who may be remembered as the specialist responsible for the identification of the child killed in a tragically publicized kidnapping case. The method used successfully was a microscopic comparison of the hair on the little corpse with that of a lock treasured by a member of the family.

Dr. Eidel's explanation is simply this: White hair in contact with an oxide of iron takes on a yellow tinge. The Indian of the grave, therefore, was an old, white-haired Indian, whose locks were turned yellow by the powdered oxide of iron surrounding the body. The pure white hair of aged Indians is frequently mentioned in the early writings of explorers and colonists. Eliot found a word descriptive of them. "Wompontupont,-one having a white head, 'hoary-headed,' Lev. 19: 32." (4) Townequestick, a Martha's Vineyard chief, in a speech reported by the Rev. Thomas Mayhew, Jr. (1646), had a bitter word to say of his contemporaries. "Now men lead a giddy life in ignorance, till they are white headed, and though ripe in years, yet they go without wisdom unto their graves." (5)

To confirm the physical fact, the writer experimented as follows: He pulverized some Martha's Vineyard bog iron ore, moistened the powder and placed a wisp of his own gray hair in contact with it. In a matter of hours, the white hair changed to a beautiful and permanent yellow.

The presence in the grave of European clothing and other articles is likewise readily explained. About four years before the arrival of the Pilgrims, a French vessel had been wrecked on this part of the Cape Cod coast. Governor Bradford's account of this wreck, as related to him by friendly Indians, is as follows: (6)

"About three years before [the attack on Dermer in 1619], a French ship was cast away at Cape Cod, but the men got ashore, and saved their lives, and much of their victuals, and other goods; but after the Indians heard of it, they gathered together from these parts, and never left watching and dogging them till they got advantage, and kild them all but 3 or 4, which they kept, and sent them from one Sachem to another, to make sports with, and used them worse than slaves."

In connection with this wreck, it is to be remembered that according to ancient custom everything that died in the water or came ashore from a wreck became the property of the chief of the tribe, and at his disposal. Matthew Mayhew (1694) states this in these words: "As the Prince was acknowledged absolute lord on the land, so he had no less sovereignty at sea; for as all belonged to him, which was stranded on the shore of his sea coast, so whatever whales or other wreck of value, floating on the sea, taken up, or landed from any part of the sea, was no less his own." (7)

The writer is assured by his friend Dr. Eidel, mentioned above as one with many years experience as a medical examiner, that the hair and flesh adhering to the bones of the corpse uncovered by the Pilgrims is evidence that the grave was not more than two or at the most three years old at the time. In other words, the death of the aged Indian had taken place after the wreck of the French vessel. There is the possibility to be noted in addition that the Indian died as the result of some infectious disease caught by contact with the Europeans. This is suggested by the simultaneous death of the old man and the child.

It is well known that the Indians of that period delighted to array themselves in European garments, obtained as gifts or taken from the bodies of the slain. The first Indians to greet Bartholomew Gosnold and his companions in 1602 off the coast of Maine, came out to the ship in a Bay of Biscay shallop, wearing oddments of European clothing. (8) One suspects that they had gotten these by overwhelming a landing party gone ashore for wood and water.

The general conclusion is that the grave, so well described by the Pilgrims, was that of an Indian chief, or possibly a high ranking noble who had had his pick of the loot from the persons of the slaughtered French, and of everything else that came ashore. The knife and the packneedle, were undoubtedly the most coveted of the lot, although perhaps of equal value in the eyes of the Indian were the sailor's smock and trousers that had become the habiliments of nobility.

The one article in the grave that perhaps must remain unexplained is the "board finely carved and painted with three tines or broaches at the top." Although the tines are suggestive of the Trinity, the board could hardly have been of Christian origin, as the Pilgrims would have been quick to recognize any "popish" figures or symbolism. It seems rather to have been a standard, or symbol of office, akin to the ceremonial staffs known to have been in use among the Beothuk of Newfoundland. One of these was decorated, according to a late survivor of

TITICUT INDIAN BURIALS

A SOLILLOQUY

Mason M. Phelps

No one apparently has noticed or if they have, have given a second thought to the incongruity of the burials found at the Titicut site in Bridgewater, under the auspices of the Warren K. Moorehead Chapter of the Massachusetts Archaeological Society and members of the Peabody Foundation for Archaeology, Phillips Academy, Andover, Massachusetts.

When one undertakes, however, to analyze the twenty-three or more burials, he cannot fail to be impressed by the variety in types of interments. One, or even two, burial customs might conceivably be attributed to a definite tribe or linguistic federation, but incongruous, when there are as many as one finds here. Let's stop for a moment and see what there is contained within this small cemetery. There has been disinterred two or three cremations, two under dispute as red paint graves, though minus the type of grave objects considered typical with such interments; one bundle burial, in which the remains are indiscriminately jumbled together, while the remainders are fairly divided between the extended and flexed types.

Another noticeable fact is that the great majority of the skeletal remains are very deeply buried and not at all typical of graves in this section of the country which are known for their shallow depth and charcoal contents and which, at the start, was the cause of overlooking several of these graves.

Even if there are two or more distinct occupations or two series of occupations as the majority think separated by a time scale of thousands of years, one can hardly credit the picking of the same spot and digging to a like depth, along with the fact that all the grave shafts, from the data obtained, extended downward from near the surface or just below the dark top soil. However, this might be the result of ploughing. Also, none of the graves overlap or are superimposed one upon another. Condition of bones when found also does not warrant too long a time interval between these burials. The depth factor leans towards death and interment in warm weather.

If we turn to history we find that there was an Indian encampment at Taunton near the falls of Mill river known as Cohamnet or Quahamock, meaning near the falls, where the Indians from Mt. Hope and other places came yearly at the time of spawning of the alewife; spending the season fishing and returning home at the completion of the run loaded down with the catch for food consumption and as fertilizer for their crops.

These fish were the principal source of industry of the early colonists at Taunton and nearly a hundred years after the first colonist settled here "the ancient standers remembered that hundreds of Indians would come up from Mt. Hope and other places, until the season for catching alewines was past, when they would load their backs with burdens and load their canoes, to carry home their supply for the rest of the year. They came to catch fish as did their fathers, before the white man came." (1)

Likewise Titicut could have served the same purpose. Here over a period of several hundred years, tribes of Indians of the same linguistic race, but with slightly different forms of burial customs, as well as other neighboring and perhaps hostile tribes gathered together under a truce agreement for the purpose of fishing and a period of social entertainment and games during the spawning of the alewife.

9. Willoughby's Antiquities, Illustration of staff, Plate 11, i, and also description of another staff, p. 70.


11. Roger Williams, Key, (Providence, 1936), p. 29.

Oak Bluffs, Massachusetts
September, 1949

TITICUT INDIAN BURIALS

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wrote, "Their affections, especially to their children, are very strong; so that I have known a father take so grievously the loss of his child, that hee hath cut and stab'd himselfe with grief and rage." (11) It is impossible to believe that an Indian child would be buried with any other than his father or grandfather. Following the ancient custom, both the old man and the child were disinterred in the grave with their most prized possessions, somehow to be carried mysteriously into the next life.

1. History of Taunton.
Though these gatherings were of short duration, there was bound to be perhaps several apart an occasional death, natural or otherwise, among this large and diversified group of people and this grave yard was a communal burial ground in which the various tribes buried their dead according to their own particular custom. This might easily account for the different types of interments and so few graves on a site producing so much in occupational material. Or perhaps these were burials due to a falling out amongst the different tribes over some cause resulting in a general fight and loss of lives as stone points were found embedded in several of the skeletal remains.

If, as it is claimed by some, from the material so far recovered that this site has produced artifacts pertinent to those characteristic to all known sites thus far uncovered in the East, (except the Maine so called Red Paint Burial Complex), it thus bears out the proceeding contention that this site, at certain seasons of the year, was the meeting place of many people. Also, unlike Ritchie and others, this writer contends that the finding of the use of certain artifacts at one site and not at another does not necessarily indicate a difference in time, but rather a preference for a certain article over another following in the footsteps of their parents as did their parents before them; their type of social or food economy or perhaps religious motivations; taboo, or personal preference. We can see the same even today in the United States between country and city dwellers, factory town and farm community, and in the numerous sects, from the Quaker to the Trappist monk and faddish organizations. Will the archaeologist of tomorrow, (300 years hence or so), in uncovering the semi-civilized races of the past and the vanished pomp and glory of the United States, place all these devious sections of living in the same time scale, or will he tend to date them in a time scale of several hundreds of years apart either prior to or after that for the more prevalent condition or a little of both. So perhaps the Indian likewise differed during this period of Titicut occupancy in their small groupings relying principally upon nature, (their livelihood), which could supply only a certain number within any given territory with daily sustenance. This differing greatly with the diversity of topography, whether the small communities lived near the shore or inland, in hilly or level stretches; the differences in climate and hence a varying plant life, and not the least important, whether they had access to the numerous mineral outcrops such as flint, chert, clay, hematite, plumbago, and stasite.

Still another factor in favor of this idea is the anomaly of land producing evidence of occupation in this vicinity covering many acres along both sides of the Taunton River and extending in some cases quite a way back from the water indicating that late comers were not choosers for the desired water sites.

Thus could have been the history of Titicut in the days when the Indian rules the land in undisputed majesty little dreaming of the days to come.

Peru, Vermont
November, 1949

SOME ASPECTS OF THE USE OF RED OCHRE IN PREHISTORIC BURIALS

Benjamin L. Smith

For many years I have been intrigued by the question "Why did so many peoples in so many parts of the world use red ochre (which is often called hematite, or red oxide of iron, or red paint, the chemical formula of which is Fe 2O3) in such a wide variety of ways in their burial ceremonies?"

Perhaps it be well first to review some of the classic examples of the use of this material as it has been demonstrated by excavation in several parts of the world. It must at once be emphasized that no attempt has been made to list all of the cemeteries or deposits from which this material has been recovered, but rather some of the more spectacular have been selected to high-light the widely diverse methods of using. Further on, certain theories will be advanced, which may suggest certain reasons for its use, but they can only be theories because at present we have no way to prove or disprove them.

Natural deposits of iron ore are found in many parts of the world. The Urals of Russia, the mountains of Norway and Sweden have vast deposits. Others are located in Hungary, Bohemia, Germany, Italy, Spain, England, Canada and the United States. Iron being one of the most widely distributed ores in Nature, it is obviously impractical to give a complete list of even the principal sources. However, it is quite clear that pre-historic peoples in many areas could obtain iron ore with little trouble.

One of the earliest European discoveries of the use of red ochre with burials was noted in conjunction with an interment in the Grotte des Enfants (Children's Grotto) in the first of the series of caves at Grimaldi, France. The burial was that of a male of the Aurignacian Culture and Cro-Magnon Race. Hematite was found underneath and on top of the skull. Peroxide of iron was found just beneath a nearby hearth. (1)

Also in the Grimaldi caves was found a burial of a woman and a youth of the so-called Grimaldi Negroid race. Hematite was found upon the skeleton of the youth. (2)

A Neanderthal burial was unearthed at La Chapelle-aux-Saint, disclosing a skeleton, accompanied by broken food bones, and fragments of hematite (possibly paint sticks). (3)

In the Grotte du Cavillon, Mentone, an Aurignacian burial of an adult male was uncovered. A great mass of powdered hematite covered the skeleton and all objects interred with it. (4)

In Barma Grande Cave, Mentone, the skeletons of a man, young woman and a youth were found in a great bed of ochre. This was a Cro-Magnon burial. (5)

The skeleton of a male of the Aurignacian period was found in a cave in Glamorganshire, England. The bones and accompanying ivory objects were encrusted with red ochre. The skeleton was too fragmentary for positive identification, but probably belonged to the Cro-Magnon race. (6)

A burial of the Solutrean period was found in the second cave of Klause, near New Essing, Bavaria. The skeleton was completely surrounded with a mass of powdered ochre. (7)

An early Magdalenian burial was found in the terrace deposits in front of a small cave near Rosillon, Afn, France. The body was accompanied by flint implements, bone artifacts and was enveloped in powdered ochre. (8)

At Brun, and again at Vestonice, which is about sixty miles from Predmost, Dr. Absolon found skeletons of the Moravian Mammoth hunters or Predmost Race, covered with masses of powdered ochre. This race was contemporary with the Cro-Magnon in France. (9)

At the Cave Grosse Ofnet in Bavaria was found that remarkable Azilian-Tardencian interment, consisting of two pits filled with human cranial. In the first pit were twenty-seven skulls; in the second, six skulls, all faced west and the whole mass was deeply stained with red ochre. Women and children predominated in the groups. (10)

In the Azilian type station, Mas d'Azil, at Arlehe, France, Piette found two burials, and was of the opinion that the flesh had been removed from the bones, which were then painted with red ochre before burial. (11)

Neolithic burials were found at Worms, in Rhenish Hesse. The burials were accompanied by a mass of red ochre. (12)

Douglas Eyers has called my attention to a number of sites at the foot of the Caucasus, which would seem to belong to the late Neolithic or Early Iron Age. Red ochre was found in these graves with which I am not familiar.

These are some of the more important European occurrences of red ochre and, summarizing the information, we find the following facts outstanding: Aurignacian, Solutrean, Magdalenian, Azilian-Tardencian and the Neolithic, and possibly Iron Age Cultures (13) all made use of the red ochre in some fashion, in connection with at least some of their burials. Men, women and children of both sexes were interred with it. Nests of skulls, covered with red ochre, and skeletons painted with it are among the specialized uses of the ore. Apparently, no use of it was made in burials before the coming of the Cro-Magnon man.

Red ochre was, of course, widely used in the Western Hemisphere, also, and it would be well to examine some of the classic uses of it here and to try to determine whether or not a common denominator is discernible.

From Ritchie's Pre-Iroquoian occupation of New York State we find the use of red ochre to be a characteristic of several different cultures which may be enumerated as follows:-

The Point Peninsula Focus of the Vine Valley Aspect consisted of several focus. At the Muskelgonne Lake component 2000 thin triangular cache blades were found solidly packed in a bushel or more of red ochre. Human burials at many components of the Point Peninsula Focus contained quantities of red ochre. Seated burials of males of the same focus were found at Avon, in Dorkee County, New York, and also at Port Maitland, Ontario. Both skeletons were covered with red ochre. (14)

Ritchie's Middlesex Focus of the Vine Valley Aspect and the classic Adena which resembles it both made use of the ochre. (15) The Holyoke graves described by C. C. Willooby (16) and later by W. J. Hope, as well as

3. The Wisdom Tree, p. 5.

13. The Mousterian has been omitted because only one reference to the use of hematite by this culture has been noted.
15. Pre-Iroquoian Occupations of New York State, p. 197.
River graves from Ritchie as "Pennsylvania Hopewillian." River north of Kinzua, Foundation, at Focus of his Laurentian Aspect, as well as remains and bone dust came from these deposits apparently components of the Ritchie Middlesex Focus. Willoughby called the Swanton cemetery "Old Algonquian" and related it to the Mound Builders. Josie Brewer's Eel River gravew from Plymouth, Mass., may be another component of the Middlesex Focus. (19)

Ritchie's Orient Focus and the Bremerton Focus of his Laurentian Aspect, as well as the Scottsville component of his Lamoka Focus are further examples of sites where red ochre was placed in graves in greater or lesser quantities. (20)

The classic Maine Cemetery Complex graves reported from forty-four cemeteries by Willoughby, Moorehead, Byers and Johnson, Hadlock, Smith and others made such copious use of red ochre in single and mass deposits of tools that it became one of the culture's salient characteristics. Enough bone fragments and bone dust came from these deposits to identify them with little doubt, as graves. In certain of the Maine cemeteries mass graves seem to have been lined and floored with ochre in great quantities before the artifacts, etc., were placed and the grave shafts filled in. Evidence of fire just above the deposit is frequently encountered.

The Pennsylvania Historical Commission found red ochre in a mound on the Alleghany River north of Kinzua, Pa., in the summer of 1931 (21) and this site has been labelled by Ritchie as "Pennsylvania Hopewillian."

The Middleboro Archaeological Society found a cemetery on the shore of Lake Assawompsett in 1931, from which graves containing red ochre were taken.

The W. K. Moorehead Chapter of the Massachusetts Archaeological Society found two or more graves in a high sand ridge near Titicut in the past summer. Deeply patinated artifacts and quantities of red ochre were torn from these graves as the owner's steam shovel destroyed them. There appear to have been no bones discernible.

Moorehead, in his "Archaeology of Maine" reports: "Seven or eight burials were found in the north shore of Lake Ontario. They were accompanied by a quantity of red ochre." (22) He does not describe just how the ochre was used.

The State University Museum at Columbus, Ohio, has some bones from a glacial kame burial. These are stained a brilliant red from contact with powdered hematite. (23)

Mr. Clarence B. Moore reports quantities of it found with skeletons in some of the mounds explored by him in the South. (24)

Prof. Henry Clyde Shetrone, in his book, "The Mound Builders," (25) while discussing modes of disposing of the dead, observes that frequently skeletons were found which had been demuded of flesh and painted with red ochre before burial.

J. P. Howley, in his famous report on the "Beothucks or Red Indians" of Newfoundland, (26) stated that this strange people not only placed packages of red ochre in their graves, but in life painted themselves and most of their possessions with it to an extent which gave them their more common name.

Cole and Deuel in "Rediscovering Illinois," reported finding three mounds in Fulton County, (20) with 562 which all contained burials of their "Red Ochre Culture." (27)

They defined this cultural manifestation as "a phase (probably of the Woodland Pattern) which is characterized by beautifully made leaf, and truncated leaf-shaped projectile points, crude pottery, copper implements and ornaments, simple burials in flexed positions, frequently associated with caches of artifacts and profuse amounts of red ochre." (28)

We consulted Bulletin No. 71 of American Archaeology, and on page 14 of an article entitled "Native Cemeteries and Forms of Burial east of the Mississippi" by Daniel I. Bushnell, Jr., found the following information:

A red powder was found in a late contact grave on Corn Hill, north of the Pamet River in Truro, Mass., in November 1620. It contained the body of an adult with a large leakage of the powder. The flesh and yellow hair were still in evidence. Grave goods were a knife and a pack needle, two or three old iron things, as well as bowls, trays, dishes, and a fine bow. The skeleton was wrapped in mats and covered with boards. A child's skeleton and possessions were found in a smaller package of red oxide.

Bushnell took the above from "Relation or Journall of the beginning and proceedings of the English Plantation settled at Plimoth, in New England." Publ. London 1622.
Thus we see that in America the aborigines made use of red ochre in much the same way as their European ancestors or contemporaries, and the question arises - why did two widely separated groups of people, thousands of miles apart, select this one substance and use it in the same way? The common denominator, if one admits its existence, is that the material was deposited in burials of people, parts of people, or objects belonging to them, in what must be accepted as graves. Again, the question arises, why?

Now let us examine several theories purporting to explain this question.

**Blood Replacement**

It has been suggested that the prehistoric peoples were probably aware of the fact that blood is necessary to support life. When an animal or human was wounded, blood naturally flowed until death occurred or the wound closed. Reasoning from this observation, ancient peoples, with the idea of assuring the continued spiritual existence of persons killed by violence, attempted to replace the all-important fluid with some substance resembling it. Red ochre appeared to fill the requirements, and was possibly used for this purpose. Ochre mixes easily with water, and produces a sufficiently bloody-looking fluid to satisfy the most critical savage mind.

But there are difficulties. A people who developed such a theory would also, of necessity, have included the body in their preservative program. How, then, are we to account for the two nests of crania found in Grosse Ofnet? No bodies accompanied this interment, yet ochre was present in quantity. How are we to explain the skeletons found in Europe and America, whose fleshless bones were smeared with ochre? The theory is not very satisfactory, and we doubt if it is the true explanation.

**Embalming Theory**

Mr. Richard Eaton of Belmont, Mass., called our attention to the theory that ochre might possibly have been used with the idea of preserving the remains. This is an interesting thought, but we have never found that Fe₂O₃ was possessed of any preservative properties. In fact, under certain conditions, rather the reverse is true. We shall have more to say in this connection later.

**Decorative Paint Theory**

Many primitive peoples used paint for personal adornment and for applying tribal marks to their bodies and faces. It would be reasonable to suppose that this custom was practised by prehistoric tribes, also, and since they invariably appear to have held beliefs in some sort of hereafter, we would expect them to make some provision for their dead to carry on the practice. Unquestionably, many small deposits of red ochre were made for this, and no other reason, but such deposits are of an easily recognized character. Paint for such purposes was usually deposited in small quantities, and was often placed in receptacles, which left little doubt as to the use intended.

But this established practice does not explain the great masses of ochre so often found. The painting equipment found in graves was probably the property of the deceased or at least resembled that used by him during his life. It is recognized immediately that a deposit of two or three quarts of ochre (sometimes the amount is a bushel or more) is a bit excessive for the needs of personal adornment. In fact, it is so far out of all reason that we must look for some other explanation.

**Symbolic Fire**

*(Incineration or Purification)*

Incineration, or cremation was practised by all of the Upper Palaeolithic races of the old world to some extent. The Neolithic races practised it in about forty percent of their burials. In America the custom was widespread, particularly through the Mound Builder area, and, also, in many Maine Complex cemeteries, although the proportion there does not seem so clearly established. The fashion appears to have waxed and waned among the peoples of all of the more recent culture groups.

Incineration may have been practised for several different reasons, which may be listed as follows:

- Crowded cemeteries.
- Purification of the deceased (to dislodge evil spirits).
- Preservation of the ashes of the deceased.

Of these, the second is the only one which we shall consider. It has been suggested that the red color of the ochre may have been used to symbolize fire, and may have been placed in the graves as a purifying element. This idea may seem far-fetched at first, but we shall mention certain facts which may make it seem a bit more reasonable.

Perhaps a closer study of the source from which the Maine Cemetery Complex people obtained their ochre, with some related facts, will suggest a theory (it can not be more) which will not only refute some of the ideas already set forth, but which may supply a rather more tenable theory.

Some of those who have studied the Maine Cemetery Complex have stated that much of the ochre was obtained from the great outcrop of ore at Katahdin Iron Works, Maine. This spot was first worked by the white man about the year 1830, and at that time evidences of prehistoric activity are said to have been clearly apparent.

I had always understood that, when the operations were fully developed, a cloud of fumes hung over the great red scar on the
mountain top, but since my visits did not
start until 1901 and the ore operations ceased
in 1890, I had no proof of the actual exis-
tence of this cloud. I therefore wrote to
an old friend, Mr. Lynn Moore, at K. I. Works,
who was familiar with the mining operations
in their most active stage, and asked him
the following questions:

No. 1  Do you know whether or not the ore
from Ore Mountain got hot when a fresh
layer was first uncovered? (This is unde-
oubtedly a leading question.)

Comment by Mr. Moore: Yes, I have no
doubts but that the ground became warm
or hot when freshly uncovered, but do not
remember for sure.

No. 2  Do you know whether or not there was
a cloud of fumes on the mountain when
the mining was going on?

Comment by Mr. Moore: Yes, from a
distance the mountain looked as though
it was on fire.

No. 3  Was there a strong odor on the moun-
tain when the mining was going on?
What was it? Was it stronger than it
is today?

Comment by Mr. Moore: Yes, I always
thought it was sulphur fumes; odour
was much stronger than today.

Further proof of this cloud of fumes
came to light unexpectedly when I was going
through some of my father's effects after
his death.

I found a letter, date-lined Katahdin
Iron Works, Maine, July 4, 1889, in which
appeared the following: "Just a bit to the
southwest there rises the low dome of Ore
Mountain, crowned always with a plume of
smoke, for when the ore is exposed to the air
it quickly catches fire and burns off part
of its sulphur, and carts are all the time
going up and down the roads with loads of
still fuming ore." Also, to my great sat-
sation, I found an old photograph, taken by
my father on that trip which showed the smoke
arising from the ore beds. I therefore con-
 sidered this phenomenon to be a firmly es-
 tablished fact, but today I do not believe
the ore got hot just because it was exposed.
I am sure there is some other explanation.

Not being chemists, Mr. Moore and others
came to the conclusion that, due to some
peculiarity in its chemical composition, the
ore got hot when freshly exposed to the air.
This oxidation was supposed to have persist-
ed for a time and then ceased as the semi-
roasted ore cooled off.

Perhaps wishful thinking led me to
accept this theory without investigation,
but always in the back of my mind was the
question - why should this ore get hot when
no other iron ores did? Even pure sulphur
could not behave that way as its ignition
point is 482°F.

With this in mind, I spent much time
studying analyses and reports of iron ores
of all kinds from many parts of the world,
but nowhere could I find a word to substan-
tiate the statements of these two eye-wit-
nesses. Yet the people who saw the fires
and smelled the fumes were not purposely mis-
leading me. They were truthful people and
therefore, there must be some other explana-
tion for the phenomenon they saw and de-
scribed.

Eventually, I came across a reference to
an early process called "calcination," used
on certain ores in preparing them for the
smelting process. (29)

Calcination was used on ores containing
much carbonic acid, or water or volatile
matter, and the purpose was to expel these
impurities as well as much as possible of the
sulphur content of the ore.

Fairbairn states the process was "some-
times effected in the open air by stacking
the ore with coal (or presumably wood) and
setting fire to it, and allowing it to burn
out --".

Analysis of the ore at Katahdin Iron
Works by a Mr. J. B. Bretton indicates the
following content:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sesquioxide of iron</td>
<td>75.95</td>
</tr>
<tr>
<td>Sulphuric acid</td>
<td>1.73</td>
</tr>
<tr>
<td>Phosphoric acid</td>
<td>1.14</td>
</tr>
<tr>
<td>Silica</td>
<td>0.17</td>
</tr>
<tr>
<td>Water and organic</td>
<td>22.34</td>
</tr>
</tbody>
</table>

Although nowhere in the records have I
yet been able to find any statement that cal-
cination was used at K.I.W., in view of the
high percentage of water and volatile mat-
terial in the ore, and because calcination was
sometimes used in the open to get rid of just
such impurities, it seems reasonable to
assume that we have here the explanation for
the fires on the mountain, and the cloud of
fumes (smoke) reported by eye-witnesses.

The ore in the beds was stated by Dr.
Thomas M. Brown, who analyzed it in 1875, to
be brown hematite or limonite, resembling a
bog ore, but even today there are brilliant
red patches of almost pure Fe₂O₃ to be seen.

Now let us do a bit of romancing. Let
us go back a few thousand years and observe
an imaginary drama as a party of Indians is
hunting through the forest. One of them
stops suddenly and points to a spot of bright
red earth at the foot of an uprooted tree.
He and his companions test the material with

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29. Iron - its history, properties and processes of
manufacture, by William Fairbairn, C.S., L.D., F.G.S.
Printed in Edinburgh, 1865, p. 54.
their fingers and find it produces a deep orange-red stain. It is "paint." They scoop up all they can carry, mark the spot and go on.

The paint proves to be the best they have ever found. It is soft; fine and very bright. They must have more, so an expedition is despatched to bring back a large amount for the use of the tribe. Returning to the mountain top they scrape away the leaves and find great patches of the material available. During the night their camp-fire which they have banked with the red earth sets the ore on fire, releasing thin clouds of choking sulphur fumes. Apprehension, fear and awe overcome them.

Have they disturbed some spirit? Is it good or evil? Will some great catastrophe overtake them? Hurriedly, offerings are made to the spirit of the mountain, and they wait for some manifestation of appeasement.

Presently their fire dies down and the fumes disappear, indicating to their simple minds that the spirit is appeased, and thus the seeds of worship of the mountain spirit are planted.

Through the years the cult grows in strength and yearly pilgrimages are made to the awe-inspiring spot, to obtain paint and to make offerings. The mountain is now sacred ground and becomes woven into their tribal rituals, until eventually the idea of burying their dead in the revered ground is conceived. It is manifestly impossible to transport the dead from the villages down the river, to the mountain, but the venerated paint can be brought in quantity to the dead and it appears that this was done. In certain of the cemeteries bushes of the paint were interred with the bodies and the accompanying artifacts, and, as stated previously, the signs of Indian work on the mountain were clearly apparent in 1830.

Now let us consider the effect of this drama upon the theories which we have previously outlined. We have not affected the status of the Blood Replacement theory, but that is hardly necessary. As pointed out before, the painted bones and the nests of skulls appear to refute this idea, except in isolated cases.

The idea of purifying the dead through fire may have been given a slight importance, and we have seen that burning ore gave off heat and fumes. It is possible that the ancient people employed the ochre for this purpose, but the theory is shaken by the fact that the ore was cold and inert when placed in the graves. Thus, unless the ore was believed to retain some symbolic purifying power derived from its original source, it would seem to have become as unfit for such a purpose as ordinary sand.

In regard to the use of ochre as an embalming medium, we must bring out a few pertinent facts.

In order to conceive the idea that the ore possessed preservative properties, the aborigines must have become aware of such properties through results obtained by accidental or intentional experimentation which succeeded in preserving some otherwise perishable material.

Now let us return for a moment to Katahdin Iron Works and climb up onto Ore Mountain. As we ascend, the color of the ground appears normal, but presently it takes on a yellowish tinge, which becomes more and more pronounced as we progress. The forest, which contained much soft wood near the bottom, is now largely hard wood, with maple and birch predominating. Presently we cross a small brook and note that the water is yellow and has a strong, rusty odor. We emerge from the thinning wood, at the top, and are met by a scene of utter desolation. A great orange-yellow scare covers the shoulder of the mountain, with hardly a live tree or shrub on it. The brook is now a clear orange-red. The skeletons and stumps of trees are lying about in wild confusion.

Below, to the right, is a swamp whose waters are devoid of life, and from the rank grass on its banks rise the trunks of thousands of dead trees.

The activities of the aborigines on an ever-widening scale, started the cycle of death by exposing to the rain the strong sulphurous ore, and as the laden waters ran from the beds into the forest, they killed everything in their way. After the Indian came the white man who, on a far greater scale, spread devastation and death in all directions.

Now, after sixty years, Nature has washed much of the poison from the wound and it is slowly healing. The great clearing is now bordered with clumps of scrub birch trees, and is becoming smaller every year, as decaying leaves replace the mould removed by the miners. In time the scar will heal and vegetation will again run riot as it did in the days when the Indians first saw the mountain. It does not seem possible that any right-minded Indian could have received the idea of preservation from a material which showed (on a smaller scale, to be sure,) such powers of destruction.

I have presented what may be a valid explanation of the origin of the use of red ochre with burials in Northeastern America, but what evidence is there that this explanation would apply to other parts of the world? There are deposits of iron ore possessing the same general characteristics as those at Katahdin Iron Works in many parts of the world. Is it not reasonable to suppose that the drama we have re-enacted on the shoulder of Ore Mountain could have been repeated wherever similar deposits occurred and that the veneration of the ochre should have spread as did such worldwide traits as the control and use of fire, flint chipping techniques, or the fabrication and decoration of pottery?
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Concord, Massachusetts
December, 1949
STONE IMPORTATION IN PREHISTORIC MASSACHUSETTS

William S. Fowler

While as yet, no intensive effort has been made to assemble all available evidence of aboriginal stone quarrying in Massachusetts, this paper is written as an incentive to further research in this field. As stone, more than perhaps any other material from the beginning of human existence, has been man's most reliable agent in his search for power, knowledge concerning its qualities and sources becomes of the greatest importance. Evidence in this realm of study is to be found in the kind of stone used for the different artifacts, as compared with stone materials from quarries of probable aboriginal working. Over the past ten years, the author has had an opportunity to examine such evidence in some parts of the state, but while much information has resulted, he is well aware that his knowledge at its best is limited. However, if his conclusions serve to develop further interest in the accumulating evidence on practically all the evidence of stone data, he will feel well repaid for whatever effort has been expended in presenting his hypotheses and postulations.

In the western part of the state a number of primitive stone quarries have been located. Steatite workings at Westfield and Wilbraham served to supply the stone bowl epoch with material for its stone eating vessels as well as for pipes and pendants. Then at Mount Tom and at Holyoke have appeared quartzite quarries where an immense amount of that stone was knocked off glacial boulders into blanks for manufacture into artifacts. Such deposits are strewn over many hillisdes throughout the area and undoubtedly account for much of the quartzite that was used. Some, however, come from glacial cobbles found in most river beds. Quartz was also derived from pebbles and cobblestones although much was quarried from quartz outcrops. Such worked deposits have been found in the Westfield Hills in Little River Valley. Granite outcrops occur at all steatite quarries as well as at Mount Tom where glacial boulders that are deposited on the lower slopes of Mount Nonotuck supplied material for some specialized artifacts such as cultivating spades and hoes. Goshenachit from deposits in the mountains above Northampton supplied the material for some pestles and clubs while the same stone in the form of pebbles was used quite generally for abraders and whetstones. An indurated red shale with limited conchoidal fracture comes from large deposits in Chicopee and is in evidence on practically all sites in the Connecticut Valley. Probably, the most extensively used stone material from this western area is basalt, (commonly called trap rock). A column formed igneous rock of relatively coarse grain with medium conchoidal fracture and of prehistoric volcanic origin, it forms elevated escarpments that appear as far north as Greenfield and extend intermittently to New Haven, Connecticut. At the river end of the Mount Holyoke range is evidence of aboriginal collecting and working of this stone on a large scale. This site has been referred to by the late William J. Rowes in "A Trading Center for Local Products in the Town of Hadley, Mass." (Bulletin of the Massachusetts Archaeological Society, Vol. 3, No. 4, p. 58). Connecticut River natives used basalt extensively from earliest days for plummets, gouge and adz blades, axes, tomahawks, picks, spades, knives, hoes, and including a few projectile points. Its color varies from light brownish-gray occasionally flecked with cream spots, to dark brown and sometimes gray depending upon the extent of weathering to which it has been subjected. Also, among the glacial gravel of the Western and Connecticut Rivers, predominately composed of quartz and chert, there existed a few pebbles of rare stones such as black and yellow flints. It is possible that they were used when found for such implements as projectile points, drills and scrapers which occasionally appear on river sites. However, no recognized flint deposits in any grade of color are known to exist in the region with or without evidence of aboriginal working. It is true that Emerson's Geology of the Connecticut Valley reports deposits of what appear to be stone similar to chaledony and agate occurring in Conway and Amherst. However, no evidence has been reported to indicate the quarrying of these deposits by the natives. Furthermore, the absence of agate and chaledony flakes on all camp sites precludes the probability that the few points which occasionally appear locally made of this material were fabricated from indigenous stone. Other mixed stone materials common in western regions of the state from which stone implements were made are hornblond, sandstone, varieties of quartz and quartzite, and some gray shales.

From Worcester to the east, hornstone and basaltite were commonly used for gouge and axe blades and may have been indigenous. In this same area are several steatite workings including Dolly Bond and Eight Lots quarries, that furnished steatite for stone bowls. Also, there are worked exposures of quartz, notably, extensive workings at Diamond Hill, indicating that this stone was apparently much in demand. As research is carried into eastern coastal regions, fewer quartzite quarries are encountered. However, may have occurred instead quantities of felsite deposits showing great variety of colors and textures. At Hingham is a banded pinkish-gray felsite outcrop, a stone that is easily distinguishable among site implement assemblages. Near Marblehead is a porphyritic blackish felsite
in boulder form showing primitive quarrying. Then at the coastal town of Scituate and at Saugus are outcrops of red jasper in varying shades and grades that show evidence of much working. All about Plymouth, the seacoast abounds with gray and bluish porphyritic pebbles and occasionally, nodules of rare agate, yellow-brown jasper, and chalcedony occur. Infrequent use of these stones for projectile points is evidenced on some Plymouth sites. Besides these stones, greenish-gray shale forms a large deposit throughout the eastern sections in outcrops and as common glacial-worn field stones, many of which when located on habitation sites show percussion-flaking. In spite of its spintery fracture, it appears to have been popular for projectile points during some early cultural periods - (a stratigraphic observation).

It may be well to state at this point that all flinty stones spoken of variously as chart, indurated shale, silicified sandstone, etc., will be referred to in a general way as flint, for the purpose of simplification. However, distinction will be made between flint and two varieties known as chalcedony and Jasper.

An examination of some Massachusetts stone projectile point collections reveals a relative diversification of stone materials conforming closely with stone provenience in the state. In coastal areas of the Taunton River Valley, as shown by the Richardson collection in the Attleboro Museum, five stone classes have the following relative quantities: all varieties of quartz, 70%; quartzite, 13%; shale, 10%; felsite, 14%; and flint, less than 1%. In Plymouth and Cape Cod areas, quartz yields some of its lead to felsite, but on the whole the relationship remains about the same. In the western section of the state, worked stone evidence seems to follow quite closely that reported from the Attleboro district with quartz and felsite leading, except that more quartzite and quartz derivatives are present. However, as an advance is made through the state quartzite appears more often. In the region of Worcester, it vies with quartz for first place with felsite losing ground, but with flint rising to 3% in eastern sections. In the Brookfields and on into the Connecticut Valley, quartz and quartzite share a leading position, with felsite running about 10% and felsite less than 1%. But here arises a paradox, for in spite of the fact that flint is prominent in most collections, there are no flint deposits in the region that are known to the author. Furthermore, habitation sites litter along the Connecticut River and its tributaries exhibit varying amounts of flint chips, spalls and cores. This material is of various colors and textures. It is predominantly light to dark gray with green and bluish tints, and is sometimes whitish, dull black yellowish and red. It is generally non-lustrous with occasional exceptions.

While the author does not profess to have obtained the exact information with reference to stone proportions for each collection examined, excepting that at the Attleboro Museum, he does believe that he has presented estimates that show unmistakable trends. However, it should be remembered that these trends are based on surface finds that are culturally mixed, and therefore, do not represent stone preferences of any particular culture period but rather a geographic distribution.

With this general picture in mind of indigenous stone preferences, it becomes apparent that the appearance of stones that are foreign to Massachusetts' regions suggests importation of such stones. Furthermore, there frequently appears locally styled artifacts, notably projectile points made of strange stones and sometimes in unusual shapes, that cannot be classified with local projectile forms. A study of this presumably intrusive material reveals similarities with forms in other parts of the country, and leads to the belief that stone importation in finished and unfinished stages was probably practiced.

In 1924, Dr. Arthur C. Parker, State Archaeologist for New York, reported on the Great Flint Mines at Coxsackie on the Hudson. At this location occurs a large deposit of flint on a hill about three miles removed from the west bank of the river. It appears in nodules and in veins that weave in and out, and was quarried on an immense scale by means of large percussion stone hammers and disks. Investigation of the site convinced Dr. Parker that a well defined stone industry was carried on at the place in which Coxsackie material was quarried both for manufacture into projectile points as well as for exportation in semi-finished spalls or blanks. He also envisioned traders coming to the site bringing undeveloped spalls or foreign stone materials for the Coxsackie workmen to fashion into projectile points. He concludes that the site was used both as a flint quarry as well as a recognized stone works for the expert chipping of points. Thus, Coxsackie emerges as a major flint quarry in the New York area and may even have been known of and used by people who lived at a considerable distance.

Charles Foster Wray, in his report, "Varieties and Sources of Flint Found in New York State," (Pennsylvania Archaeologist, Vol. 18, Nos. 1-2), refers to Flint Mine Hill near Coxsackie as the largest and most important New York State quarry but states that eight additional flint deposits in other areas are known to have been used by the aborigines.

A study of some private collections in Massachusetts has revealed a number of projectile points with certain traits that imply foreign affinities. Usually such points are made of stone that is not known to be indigenous and this more than form seems to label them as importations. However, projectile style often contributes toward this hypothesis, although form is usually an uncertain criterion. Shapes of points the world over tend to approach similar proportions and yet there are a
few outstanding differences that are more diagnostic than minor variations. The latter, probably, should not alone be used in establishing forms. Many material, for all variations of this kind could too easily result from independent invention, or from stone flaking differences. On the other hand, outstanding form differences, referred to here, are significant and may supply what seems to be convincing evidence. Furthermore, there are sometimes certain marked regional shape preferences that serve to make a source hypothesis more convincing such as Mohawk-Iroquoian small icoseose triangular points or Ritchie's Oswasco cono-base triangular forms. Hence, when a point is made of foreign stone material and has a similar shape to points in the region of source, importation as an explanation of its presence is implied.

Probably it will never be known just why or how importations occurred, but there are several likely hypotheses that may be deducted from available evidence. Stone procurement groups may have entered into trade to obtain choice stone material from distant regions. In this case, resultant implement forms would probably have assumed those of the area to which the stone material was brought. However, in cases in which foreign implement styles and stone material are well defined, artifacts may have been left through trade, by raiding parties, or as a result of loss in connection with peaceful travel missions, or possibly due to temporary settlements.

For coastal areas, such as Massachusetts, it is obvious that importations of such stone material as was not indigenous had to come from either the north, south or west. In New Hampshire, Vermont and Maine, to the north, no deposit of flint of suitable quality has been brought to the attention of the author, and as no known flint outcrops occur in the immediate vicinity, one should look to the west for this stone when supplied in quantity. Wray's report shows outcrops of flint in various grades extending easterly in a ridge across the state of New York, down the Mohawk Valley to the Hudson River and then turning south and running off into Pennsylvania with scattered outcrops appearing to the north in Lake Champlain districts. With these great deposits of flint lying only a hundred or more miles away to the west, it seems but natural that in time they would have attracted coastal attention and become the major source of flint for eastern provinces. However, the difficulty of transporting great quantities, as would obviously have been required for general use, probably prevented flint utilization to any large extent. Nevertheless, in the western part of Massachusetts throughout the Connecticut Valley as far north as Deerfield, fairly large quantities of this stone were in use to judge from chip refuse appearing on many camp sites. Figure 12, No. I, illustrates a large flint chip of black flint with heavy patina of rusty whitish weathering from Whately, Connecticut Valley, collection of C. C. Ferguson. This exhibit resembles Whitehall dolomite flint from the Lake Champlain region and may represent one of the forms in which flint was imported. Another form is that of a nodule which sometimes appears. From such observations it seems probable that New York flint came into this region in reasonably large quantities, probably by water, which seems perhaps to be the most logical form of transportation. However, it should also be noted that there were two recognized well established trails leading over the mountains to the west from the Westfield and Deerfield Valleys.

While it is true that the author has no knowledge of flint outcrops of suitable quality occurring in Vermont, New Hampshire or Maine, at Mount Kineo, Moosehead Lake, Maine, is a massive escarpment of porphyritic greenish-gray felsite, with only a medium conchoidal fracture known as Kineo felsite. Evidence of aboriginal quarrying and worked imported clays is identifiable as being made of this stone appear in certain parts of Maine. However, marked evidence of its use further south in the environs of Massachusetts is lacking although occasional flakes of stone resembling this felsite sometimes appear. Therefore, so far as the Bay State is concerned, Maine, New Hampshire and Vermont as established sources of aboriginal flint or other stones should probably be dismissed from further consideration.

However, one local flint source should be mentioned. It was readily accessible to Massachusetts natives and is known to have existed in Colonial days. At one or two places along the coast ther were dumped flint spills and nodules brought as ballast by ships from Europe in Colonial days. There is evidence to suggest that natives in the vicinity helped themselves and were the means by which this flint in limited quantities found its way into adjacent coastal regions. A flint spall from Martha's Vineyard has just been found. It is saturated on one edge for a knife and may have been made from this jetisoned material. The specimen has a grayish-brown waxy appearance, excellent conchoidal surface, and a high lustre. It has a whitish nodule triplis on one facet exhibiting a tendency to deep porosity. Nevertheless, it should be noted that such finds, even on coastal sites, are rare and seldom if ever occur further inland. This probably precludes the existence of anything but a limited localized source, such as the one referred to, for this waxy appearing flint.

At this point, for purposes of identification, it may be well to examine distinguishing characteristics of New York State flints as presented by Wray and as observed by the author in some cases. Only those from known aboriginal workings will be described including flint from Little Falls dolomite, Whitehall limestone, Deepkill and Normanskill shales, Lockport dolomite, Helderberg limestone series, Craskany sandstone, and Onondaga limestone.
LITTLE FALLS DOLOMITE FLINT - has Mohawk Valley outcrops that occur in layers and nodules. Deep deposits have a pearly light-blue color with tendency to surface translucency, but with some brownish weathering. At Knauderack quarry it is from an upper deposit and has a whitish color stained by brownish-gray, blue-gray, and less frequent red streaks. This white variety is commonly known as Knauderack flint. All varieties of Little Falls flint have a well-formed conchoidal fracture, a relatively fine grain but with little or no lustre.

WHITEHALL DOLOMITE FLINT - from relatively small patches in the northeastern section of Champlain Valley is rather impure flint. It resembles Little Falls flint except that it has a more fibrous texture and may be identified by its dark blue to blue-black and gray-black colors. It has a curled structure of an irregular formation and weathers with a whitish patina that has no lustre.

DEEPKILL SHALE FLINT - important exposure is at Coxsackie Flint Mine Hill just south of Hudson, New York, where it occurs in thin bands one-half to four inches in thickness. It is relatively fine-grained with a well developed conchoidal fracture but usually with no lustre. It may be distinguished by its characteristic apple-green-gray color that occasionally becomes blue-green. Other shades that sometimes occur are brownish-gray, blue-gray, and less frequently various reds. Slight mottling and streaking of colors sometimes is present. Small masses of hematite dust having the appearance of rust are scattered along vein faults in some cases and tendency to weather is negligible.

NORMANSKILL SHALE FLINT - fine exposures are at Rice Mountain near Grant Hollow and at the foot of Church Hill near Catskill, New York, where it occurs in veins which often stand out in the shale beds as distinct ridges. It fractures with only a medium conchoidal surface while much of this flint appears as indurated shale with a splintered fracture. Its color is generally gray or black in the central part of the Hudson Valley and frequently is banded with light green-gray or red streaks in Washington County to the north. It weathers with an overall light gray or whitish patina.

LOCKPORT DOLOMITE FLINT - at outcrops in the Province of Ontario, Canada, and at the international boundary in Niagara County, New York, where it occurs in nodules, sometimes rounded, and sometimes in flattened lenses. It is hard with a medium conchoidal fracture that tends to splinter. Its color is gray-blue with variation to a whitish color with brown stains and often has a mottled appearance with fossil content.

HELDENBERG LIMESTONE FLINT - one of the best outcrops is in the vicinity of Catskill, New York, where it appears in small nodules and localized lenses. It cannot be distinguished by its dense dull shiny black color that sometimes runs from blue-black to gray-blue. It exhibits a poor to medium conchoidal fracture development with fracture planes being common along which the flint separates upon conchoidal fracture. Many nodules have a thick encasing layer of tripoli and large fossil fragments are numerous.

GLENERIE LIMESTONE FLINT, (Helderberg series) - the best exposures are in the vicinity of Cobleskill and Catskill, New York, where it occurs as limestone deposits. It consists of a silicified limestone of incipient flint with a drab gray color. This sometimes appears in deeper shades such as gray-blue and black, but gray is more frequent. The common drab gray color, often caused by weathering, occasionally has rusty stains. The stone fractures with a medium conchoidal surface and frequently has small fossil fragments imbedded in it. Its surface is often grainy and never has lustre.

ORISKANY SANDSTONE FLINT - outcrops occur in the central part of New York State where nodules up to eight inches in diameter appear at the top of the formation. This nodule flint is distinguishable by its black sandy appearance, (silicified sandstone), with glassy spots here and there.

ONONDAGA LIMESTONE FLINT - deposits are more in evidence in western New York and across the Ontario, Canadian border, where it occurs in four to five inch nodules and discontinuous veins. Its color varies somewhat depending upon its geographic location, but in general is a drab brownish gray. In eastern New York, the color is lighter with bluish hues, while at Buffalo it becomes black. In western regions, the color assumes a mottled blue-brown or tan shade with sometimes reddish stains. The stone breaks with an excellent conchoidal fracture and has a dull vitreous lustre.

Examination of Connecticut Valley habitation sites flint chips, spalls, cores and artifacts leads to the belief that such exposed flint material has a probable Hudson or Mohawk Valley provenance. Some of this flint may be readily identified by its apple-green-gray, fine grained appearance and excellent conchoidal fracture as Coxsackie Deepkill flint; other pieces by their dense dull shiny black appearance and medium conchoidal fracture as Helderberg flint; still other material of dark brownish-blacks with high lustre as Onondaga flint; while some flint, especially in the vicinity of Mount Tom, by its coarse grained drab light to dark gray silicified limestone appearance, with moderate conchoidal fracture, as Glenerie limestone flint; and at the same location, whitish flint with good conchoidal fracture, fine grained with no lustre to speak of as Knauderack, (Little Falls), flint. The remaining flint refuse exhibits variations which tend to limit or confuse comparative analysis. Nevertheless, it is likely that with five New York State flints probably identified, most of the remaining Connecticut Valley flint also came from the same source areas or from other New York flint deposits. So far as red jasper is concerned, such flaked evidence as exists in
the Valley, which is admittedly scarce, could be imported material either from eastern Massachusetts Scituate deposits or from Coxsackie flint mines. Flakes of Deepkill flint occasionally are red. Flakes of yellow jasper, chalcedony and agate have not appeared, suggesting that finished projectile points of these stones, probably in the main, came from outside regions.

What seems like a notable example of flint importation is to be found in a fractured drill, (Fig. 12, No. 2). This specimen came from site M-18-11/6 at Mount Tom on the west bank of the Connecticut River. It is made of what appears to be a coarse grained incipient flint with poor conchoidal fracture and has a drab medium gray color. It has no lustre and would seem to fall within the classification of silicified limestone with relatively strong tensile strength. The drill base has been fractured and the cause quite obviously was the inclusion in the stone of a fossil shell 5/16" in length whose matrix now appears in the fractured seam. Another small fossil matrix only 1/16" in length appears near the end of the bit. Both matrices appear to have been made by the same kind of shell. The stone shows light rusty-brown weathering over most surfaces and in shell matrices. This description seems to fit closely that given by Wray in his identification of New York Glenerie flint. The question of whether this drill is of local or foreign manufacture is of less relative importance than the question of source for its flint content. While in many cases, comparative stone analysis is subject to some speculation due to great variation in most stone deposits, in this instance, there can be little doubt that the flint with its fossil content is from the Glenerie silicified limestone deposit of the Helderberg escarpment. A large stemmed knife and numerous flakes of what appears to be the same silicified limestone from this site suggests that Glenerie flint had been imported in the rough to be made into various artifacts at the Connecticut Valley site.

At another valley site in Hadley appears a preponderance of flint flakes. One gathers the impression that here was a large flint work shop that may have furnished finished artifacts to the surrounding region. Certain it is that the artifact collection in the Hadley Library has many flint projectile points, collected from the fields in this area. In this context a conspicuous place in this assemblage.

Another example of flint importation is to be found at the Ragged Mountain site in Connecticut. Here there appeared chips and several artifacts with an apple green-gray color and a well developed conchoidal surface. This Ragged Mountain flint closely resembles Deepkill flint from Coxsackie and its presence here in the form of flakes clearly indicates importation of flint cores to this mountainous site for manufacture into implements.

On a Granby Road camp site in South Hadley is an interesting example felsite importation. Here there was ploughed up what appears to be a cache of gray porphyritic projectile blades. They are preserved by the Lamb family of that town in their artifact collection. The cache consists of approximately forty-five blades all about the same shape and size with incipient bases. The material is identifiable as felsite from either the Marblehead quarry or other felsite exposures in that vicinity. It is conspicuous in South Hadley by its appearance in an area that is devoid of all traces of felsite cut-crops.

At Plymouth has appeared a few flint flakes and nodule pebbles on camp sites to indicate that a limited flint source in this region probably came from the local glacial deposit. Here there is evidence of a great variety of rare stones in flake and nodule form, but in relatively small amounts such as whitish chalky appearing stone with pink streakings without patina, deep orange agate or chalcedony, brownish-yellow and black flint, but apparently little or no greenish, bluish or brownish-gray flint such as is known to exist in the Mohawk and Hudson Valleys. If the variegated material in Plymouth is from glacial drift, it obviously was infrequently used for artifacts of it represent a bare fraction of 1/2 in collections from the area. In fact, even when considering all flint materials including frequent appearance of Scituate red jasper, flint represents not over 1/2 in Plymouth artifact assemblages.

PROBABLE FOREIGN PROJECTILE FORMS

Acknowledgement is gratefully made to the following Massachusetts collectors, all members of the Massachusetts Archaeological Society, for their assistance in permitting the illustration of specimens from their collections to be included as evidence in this report: George H. Barton, Richard H. Bent, C. C. Ferguson, Mrs. Elizabeth B. Flanders, William S. Pierce, Walter S. Rodiman, Charles F. Sherman, and William W. Whiting. Due to duplication in the case of some of these specimens and the lack of space, it has been impractical to illustrate all factual evidence as furnished. Nevertheless, it has all been helpful in the development of conclusions that are advanced in this paper. For each illustrated specimen a description of the stone from which it is made will be given together with other pertinent information. All specimens shown in Figure 13 appear to have affinities for some of William A. Ritchie's New York State cultures, except exhibit no. 2, which may have a Mohawk-Iroquoian provenience.

Fig. 13, no. 1, Isosceles triangular, concave base; of dull brownish-gray clouded flint, fine grained with slight weathering only; resembles Coxsackie Deepkill flint; from site M-18-54, North Hadley, Connecticut Valley; has probable affinity to Canandaigua Focus, Owasco Aspect; collection of the author.

Fig. 13, no. 2, Isosceles triangular,
small size, straight-based; of medium brownish-grey fine grained lustrous flint; probably is Onondaga flint; from site M-29-1, Agawam, Connecticut Valley; has appearance of Mohawk-Iroquoian origin; collection of the author.

Fig.13, no. 3, Elongated eared broad-based; of light brownish-grey fine grained flint with lustre; possible source is Onondaga flint; from site M-22-2, Plymouth; possible affinity to Point Peninsula Focus, Vine Valley Aspect; collection of William W. Whiting.

Fig. 13, no. 4, Narrow triangular, concave base; of purplish-red jasper; without indigenous indications; it has a probable source in either Normanskill shale flint, Coxsackie, or Pennsylvania jaspers; from a Plymouth camp site; close counterpart may be found in New York Focus, Hopewellian Phase, Squawki Hill Site; collection of William S. Pierce.

Fig.13, no. 5, Wide side-notched, straight-based with meticulous flaking; of fine grained whitish flint with a pink streak, well formed conchoidal fracture and slight lustre; well defined source indicated as Knaunderack white flint, (Little Falls dolomite); from site M-29-1, Agawam, Connecticut Valley; probable affinity to Point Peninsula Focus, Vine Valley Aspect, Sea Breeze Site; collection of the author.

Fig.13, no. 6, Corner notched, convex base with meticulous flaking; of fine grained whitish flint with a pink streak, well formed conchoidal fracture and slight lustre; well defined source indicated as Knaunderack white flint, (Little Falls dolomite); from site M-29-1, Agawam, Connecticut Valley; probable affinity to Point Peninsula Focus, Vine Valley Aspect, Sea Breeze Site; collection of the author.

Fig.13, no. 7, Small side-notched, broad-based; dark gray flint with high lustre; closely resembles Onondaga flint; from site M-29-1, Agawam, Connecticut Valley; close affinity to Brewerton Focus, Laurentian Aspect; collection of the author.

Fig.13, no. 8, Elongated side-notched, square-based; light bluish-gray flint with some lustre and no weathering; probably Onondaga flint; from a Plymouth camp site; closely identified with Point Peninsula Focus; from a Plymouth camp site; collection of Richard H. Bent.

Fig.13, no. 9, Corner notched, convex-edged, straight-based; thin blade of fine grained light gray flint with some lustre; probable source suggested is Onondaga flint; from Dighton, Taunton River Valley; affinity to Point Peninsula Focus, Vine Valley Aspect, Kipp Island Site, suggested; collection of George H. Barton.

Fig. 13, no. 10, Corner-notched, convex base and sides; light bluish-gray flint with lustre and no weathering; probably Onondaga flint; from a Worcester camp site; closely identified with Point Peninsula Focus, Vine Valley Aspect, Sea Breeze Site; collection of C. C. Ferguson.

Fig.13, no. 11, Semilongwise-shaped; black flint with dull lustre and well formed conchoidal fracture; probable source is Onondaga flint, Buffalo deposits; from a Plymouth camp site; reminiscent of Point Peninsula Focus, Frontenac Island site; collection of William S. Pierce.

Fig.13, no. 12, Elongated side-notched, broad-based; yellow Jasper with dull Lustre and good conchoidal fracture; possibly Onondaga flint, western deposits; from a Hatfield camp site, Connecticut Valley; closely identified with Brewerton Focus, Laurentian Aspect, Oberlander Site; collection of Walter S. Rodman.

Fig.13, no. 13, Elongated eared broad-based; white flint, thin blade with rust stained patina and medium conchoidal fracture; resembles Lockport dolomite flint more than any other New York State flint; excavated from yellow subsoil about 6 inches from surface of ground on a Plymouth site; culture affinity is not well defined; but to some extent resembles Brewerton Focus, Laurentian Aspect; collection of Richard H. Bent.

Fig.14, no. 1, Sharp barbed corner removed form; orange and black banded agate, translucent with high vitreous lustre; reminiscent of some projectile point forms from the West where similar agate occurs; from a Hatfield camp site, Connecticut Valley; collection of Walter S. Rodman.

Fig.14, no. 2, Wide and long parallel shank, square based; rare garnet-gray curved fibrous flint, apparently not indigenous, dull but with a well developed conchoidal fracture; from a Wayland habitation site, Concord River Valley, excavated deep in yellow subsoil, not associated with other site goods; Yuma-like, exhibits some Scottsbluff Yuma traits, possibly later short form showing modified development; collection of C. C. Ferguson.

Fig.14, no. 3, Side-notched, bifurcated, square-based; black obsidian, tendency to translucency with high vitreous lustre; typical Monk's Mound point, Cahokia culture, southern Illinois - also resembles type IV projectile points of northeast Missouri; nearest source of obsidian is Wyoming with large exposures further west in Oregon where both black and brown obsidian occurs; from site M-29-1, Agawam, Connecticut Valley; collection of the author.

Fig.14, no. 4, Wide side-notched, concave base with flaring tangs; dull light yellow flint, fine grained with a well formed conchoidal surface; classic form of type III projectile points of northeast Missouri; from site M-29-1, Agawam, Connecticut Valley; collection of the author.

Fig.14, no. 5, Corner removed, long
rounded shank; light bluish-gray flint with thin brownish patina and a dull luster; reminiscent of Ohio Adena Mound-building culture; from an Attleboro camp site; Richardson collection, Attleboro Museum.

Fig. 11, no. 6, Ground slate, basal fluted on two sides; light gray slate; suggestive of spears of Maine Cemetery Complex, although not identical with any known example, (Moorehead's Red Paint, Willoughby's Pre-Algonquin-Maine manifestation - culminated); excavated on a Plymouth site four feet deep in a 6 inch black stratum with sandy gravel above and below; collection of William H. Whiting.

Fig. 11, no. 7, Convex sided, corner removed base; cream streaked light gray flint, with dull luster and a well formed conchoidal fracture; resembles some buffalo points from prairie cultures; from a Taunton Valley camp site; collection of George H. Barton.

CONCLUSION

An attempt has been made in this paper to present factual evidence that will tend to prove the existence in Massachusetts of stone materials, mainly flint, with implied foreign provenience. The appearance of worked flint, presumed not to be indigenous, in quantities of less than 1% in coastal areas and increasing to about 10% in the Connecticut Valley is suggestive of more frequent contacts with foreign flint sources in the latter district. Stone Emerson's Geology of the Connecticut Valley reveals no flint deposits, except isolated outcrops of agate and chalcedony with no signs of aboriginal working, it may be assumed with some degree of certainty that flint was procured by the river natives from nearest available deposits occurring outside the Valley.

Mohawk and Hudson Valley flints lay only about a hundred miles to the west. However, as all available land routes ran through thick forests and over extensive mountains, it is quite likely that contact was made by water with procurement of flint by canoe the most feasible method. The trip by water would have consumed but a day or two and the principal flint deposits at Coxsackie and Catskill were readily accessible from the Hudson River.

With evidence of flint procurement from Coxsackie occurring in the steatite industrial epoch, as evidenced by Deepkill flint at the Ragged Mountain site in Connecticut, knowledge of the availability of flint from western regions evidently existed at a comparatively early date. Later on, it is quite likely that flint importations also came into the upper Connecticut Valley by overland routes, notably the Mohawk trail by way of the Hoosick Valley. Greater accumulations of flint appearing on sites from Hadley to Deerfield seem to suggest this postulation. Contributing evidence is to be found in the flaked spall from Whately, (Fig. 2, no. 1), as it is probable that this may be Whitehall dolomite flint from the Lake Champlain region.

However, after all available evidence is analyzed, methods of flint procurement are still uncertain. That New York State flint was imported seems now to be a strong probability. But to say that it was traded for certain Massachusetts stones such as basalt and steatite cannot at present be substantiated. The author has searched New York collections in the vicinity of Schenectady in vain for a trace of Connecticut Valley flint and steatite. The New York basalt as appears in the form of axe and gouge blades is of a finer texture and without the common rusty brown weathering so characteristic of western Massachusetts outcrops. Evidently, New York basalt came from another source. The same is true in the case of steatite. Schenectady specimens do not seem to have surface traits of known Massachusetts steatite deposits, and may be assumed to have had a different provenience. Recently, reports have arrived of the possible existence of steatite deposits in the hills to the east of the Hudson River, below Albany, and if found to be correct may provide a possible steatite source for the New York area.

Therefore, in the procurement of flint by Massachusetts natives, especially in western districts, other methods must be found, probably, other than merely that of stone barter. It seems to the author more than likely that procurement was in the hands of small groups who went out from river camps by canoe to the flint quarries of the Hudson and Mohawk Valleys. Whether they bartered for the flint or had free access to it will perhaps never be known. Whichever was the case, it becomes increasingly apparent that flint from New York deposits came into Massachusetts regions, presumably as importations, and was used in varying amounts depending upon accessibility to the source.

Evidence has also been presented in this paper in the form of projectile points, probably of foreign stone and manufacture that suggest a culture and over many centuries by the natives of Massachusetts with those of relatively distant regions. Such contacts, which for the most part were probably not more than individual affairs without migratory implications, may have served among other things to introduce certain new ideas or inventions such as agriculture and ceramics. Nevertheless, there seem to be enough foreign manifestations present both in the form of projectile points as well as in that of ceramic potsherds ("Ceramic Design Elements of Massachusetts," Bulletin of the Massachusetts Archaeological Society, Vol. 8, no. 1, pp. 1-5), to suggest occasional temporary settlements of New York State natives in the Connecticut Valley and possibly in some adjoining regions.

Schenectady Complex, although not identical with any known example, (Moorehead's Red Paint, Willoughby's Pre-Algonquin-Maine manifestation - culminated); excavated on a Plymouth site four feet deep in a 6 inch black stratum with sandy gravel above and below; collection of William H. Whiting.

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Fig. 12 - Connecticut Valley Specimens.

Fig. 13 - Rare Massachusetts Flint Points of probable New York State Provenience.

Fig. 14 - Rare Massachusetts Points of probable provenience other than New York State.
THE JOHNSON'S SPRING SITE

Ripley P. Bullen

The Johnson's Spring site is located in the northwest part of Peabody, Massachusetts, a short distance from the Middleton town line. This site surrounds a free flowing spring situated fairly high up in the hills bounding the southern side of the Ipswich River valley. Water from this spring flows about a third of a mile and drops at least 90 feet before it reaches the river. Such a location would appear to be rather isolated for an Indian village. However, it was occupied by different groups of Indians or by the same group, possibly intermittently, during a long period of time for their industrial arts to have become profoundly modified.

A sketch map of the Johnson's Spring site is presented in Figure 15. The spring has been cleaned out, walled with cement, and protected by wire. The top of the southern side of the wall of the spring was used as a datum for the site and for the construction of contours south of the spring. Unfortunately, contours to the north were not recorded. However, the plowed fields slope downward towards the north. Land between the house and the foot of the eastern plowed field is level. To the north of the house rather steep slopes are found. A short distance to the east, possibly two hundred feet, is a good sized level field which should have been ideal for agriculture.

Johnson's Spring offered Indians a constant source of good drinking water and reasonably level ground for cultivation or habitation. Nearby they could find animals, birds, and fish. While slightly off their main line of communication, the river, they were not completely isolated from cultural influences. Perhaps they considered semi-isolation a good attribute of the site.

Evidences of Indian occupation were found in four places; the two plowed fields beside the brook and the two undisturbed higher areas consisting of the small spur of land to the southwest and the higher fairly level area about a hundred feet south of the spring. As this paper is limited to excavations in the latter place, it may be well to mention here that many Indian artifacts, including ceremonials, have been found in the plowed fields. C. C. Willoughby is said to have spent a day at the site but no record is available of his trip.

Excavations south of the spring were conducted during May and June of 1948, by members and friends of the Northeastern Chapter of the Massachusetts Archaeological Society. The Chapter is indebted to Mr. Eric L. Johnson of South Peabody, Massachu-

netts, owner of the site, for permission to do this work.

The excavated area of the site was nearly level, not varying more than eight inches in elevation between any two points. It was covered with small trees, mostly scrub oak. Soil consisted of sandy loam which became lighter in color and more sandy with depth. In this soil profile certain zones were delineated and arbitrarily designated as dark loam, yellow-brown loam, yellow-brown sand, and light colored sand. The latter was encountered in a few places at depths of 17 to 30 inches. In two places, Squares 6-P and 3-0, tops of large granite boulders were uncovered. The top of one was 12½ inches and that of the other 23 inches below the surface.

Dark loam was dark brown, sometimes black-brown, in color. It was from 3½ to 6 inches thick including the sod, which was about 1½ inches in thickness. The remainder of this zone, 2-½ inches thick, contained cultural material which in part differed from that found in the yellow-brown loam below.

Yellow-brown loam, varying from 4 to 8 inches in thickness, differed from dark loam in color and contents. It was dark yellow-brown or brown-yellow-brown in color and contained imnumerable granitic rocks. These rocks were randomly located except where Indians had used them as building material. Also present in yellow-brown loam, near its top, were small bits of calcined bone, presumably those of deer. Both rocks and bone were absent in dark loam above. Yellow-brown loam contained pottery and projectile points which differed from those found above.

Yellow-brown sand was lighter in color, more sandy, and contained fewer rocks than yellow-brown loam. While a few chips and projectile points were found in yellow-brown sand, it was essentially unproductive. This zone was not completely excavated over the entire area so that it is impossible to give its range of thickness. Where measured it averaged 12 inches thick.

Features

Features found at the Johnson's Spring site include post holes, pits, stone pavements, a hearth, a cache, and burials. To locate these features references will be made to the excavation grid drawn on the sketch map of the site (Fig. 15). Stakes were numbered from east to west and lettered from north to south. Numbers and letters of some stakes have been indicated and it is believed those of the
Their tops were noted as a depth and the same distance vertically. Its top was noted at a depth of 5 inches. Four brown deposits in Square 6-0, found at the junction of yellow-brown loam and yellow-brown sand, may have represented post holes. While 2–3 inches in diameter and forming an approximately straight line running north and south, they did not penetrate any substantial distance into yellow-brown sand.

Another such posthole was recorded for Square 2-P. It measured 3 inches in diameter and the same distance vertically. Its top was noted at a depth of 5 inches. Four brown deposits in Square 6-0, found at the junction of yellow-brown loam and yellow-brown sand, may have represented post holes.

Pits were located in Squares 2-0, 6-N, 7-P, 7-Q, and 8-O. They varied from 6 inches in diameter to 15 by 18 inches across and from ½ to 2½ inches in vertical dimension. One, filled with black dirt and charcoal, lead downward from the dark loam. Tops of others were all found in yellow-brown loam between depths of 11 and 11½ inches. One contained five rocks and charcoal, the others brown dirt and bits of charcoal.

Several tests were made to the southwest of Stake 12Y in an attempt to locate additional burials. These tests located pits and various disturbed areas. Some of the latter appeared to represent trees uprooted by wind. Three pits, one each in Squares 12-Z, 19-Z, and 18-AA, varied from 2 to 3 feet across and from 7 to 14 inches vertically. All contained brown dirt and a little charcoal but were otherwise sterile. These may have been storage pits located a short distance away from the main habitation.

The largest stone pavement, located between Stakes 7-P and 9-P, was only partially excavated due to a large tree. This pavement extended 6 feet east and west and at least 30 inches north and south. It was built of graniteic rocks piled on top of each other to a thickness of 6 inches. The top of this structure was encountered in yellow-brown loam at a depth of 8 inches. One sherd of coarse mineral-tempered pottery and some charcoal were associated with these rocks.

The tops of those surrounding it. This feature was very suggestive of a small hearth but there was no charcoal present.

In Square 2-P granite cobblestones formed a circular platform, 16 inches in diameter. As usual this was situated in yellow-brown loam.

Another such posthole was recorded for Square 7-R. It measured 3 inches in diameter and the same distance vertically. Its top was noted at a depth of 5 inches. Four brown deposits in Square 6-0, found at the junction of yellow-brown loam and yellow-brown sand, may have represented post holes.

A slightly different arrangement was found in Square 8-0. Here granitic, sedimentary, and felsitic rocks formed a rectangular platform, 17 by 20 inches, in yellow-brown loam.

The function of these stone pavements or platforms is one of the problems of New England archaeology. Some of them are crudely made and may be fortuitous. Others are definitely assembled by human beings. It has been suggested that the pavement in Square 6-0 was built by Indian children while playing. If so, were they playing house, which would imply that larger ones might be house floors? I have suggested elsewhere that the larger ones at the Foster's Cove site might be house floors (See "The Foster's Cove Site," Vol. VII, No. 2, this series).

Mr. Howard Torrey of Reading has suggested that smaller ones might be platforms for some object, such as a wooden mortar, which Indians wished to keep off the damp ground. Mr. Douglas S. Byers of the Robert S. Peabody Foundation for Archaeology has suggested that some may be the remains of sweat houses (See "A Possible Explanation of Fire-beds or Hearths," Vol. V, No. 4, this series).

A stone hearth was found in Square 3-N. It was completely paved, shaped like a saucer with raised edges, 30 inches in diameter, and filled with charcoal. While situated at the junction between dark loam and yellow-brown loam, tops of peripheral rocks were only 2½ inches below the surface. This hearth must be considered as having been built by the last, or nearly the last, Indian inhabitants of the site.

A cache of raw material for the making of stone implements was located in Square 2-0. It consisted of nine rough, unshaped pieces of slightly patinated felsite, each about ½ by 2 by 1½ inches in size. This raw material was packed into a space 7 by 6 inches in area and 3½ inches vertically. The top of this cache was in yellow-brown loam, 2 inches below the base of dark loam. There was no
Three burials were uncovered at the Johnson's Spring site: two double burials and one represented by only six bones. The horizontal arrangement of these burials is given in Figure 16, and the vertical situation of Burials 1 and 2 is illustrated in Figure 17. This profile shows, between Stakes 9-W and 10-W, part of the south end of the pit containing Burial 1 and, to the west, two of the bones in the pit of Burial 2. The line representing the surface indicates the top of the sod. Thickness of sod has not been indicated.

Presence of these burials was suggested by slight depressions in the surface of the ground. Such a depression will be noticed on the profile over Burial 2. The profile also indicates the zone from which these burial pits were dug.

Burials

All burial pits had very clearly been dug through the dark loam, or at least through the lower part of it. Dirt thrown out at the time of inhumation was found on top of dark loam and extending upward into the sod as shown on the profile under Stake 9-W. The thin zone of dark loam shown under this thrown-out dirt may represent sod present at the time of burial. This situation as regards thrown-out dirt and dark loam for Burial 1 was duplicated at Burial 3. The pit for Burial 2 was also clearly dug from an elevation approximating that of the present surface. It seems evident that all three burials occurred at approximately the same time and that these events happened during the last occupation of the site.

Dr. Frank Speck of the University of Pennsylvania, when he visited the site, asked if we had found any evidence of the four day fire that was supposed to be part of the funerary service. Evidence permitting of that interpretation was found with all three burials.

In the case of Burial 2, it consisted of a black zone in the top of the burial pit as shown on the profile between Stakes 10 and 11-W. For Burial 1 there was a black deposit which nearly filled the southwest corner of Square 10-V. This deposit was a few inches below the surface and considerably thinner than that of Burial 2. At Burial 3 the black deposit was located several feet to the southeast of the burial pit. Here charcoal and a few broken rocks were found between depths of 9 and 12 inches in a pit separate from that which contained the skeletons. However, disturbed dirt connected the tops of these pits suggesting them to be contemporaneous.

The two skeletons of Burial 1 were found at the bottom of the burial pit arranged as shown in Figure 16. The base of this pit was 19 inches below the present surface. The skeleton, whose bones have been stippled, was that of a female and the other that of a male. Both represented middle-aged individuals to judge from tooth wear, loss of some molar teeth during life, and presence of some suture closure. More bones were found of Burial 1 than have been indicated. These were chiefly located in the southern part of the burial pit among and below the leg bones.

At first glance it would appear that the two people of Burial 1 had been buried at the same time, completely articulated, on their sides, facing each other, and with their heads to the northwest. If this was the case, then there has been a considerable post-burial movement of the leg bones of the male skeleton; movement which separated them from their normal position in respect to the upper part of the body but did not disarticulate the bones of either leg. There is a possibility, there-
fore, that the male was partially dismembered at burial or that the female was buried later and the leg bones of the male pushed to one side.

There is no problem of this nature regarding Burial 3. All bones which had not decayed were in their normal relationships as illustrated. The skeleton with right hand on top of the back part of the skull is believed to be that of a female. Judging from the loss of the lower first molar in life and from a fair amount of suture closure, she was middle-aged at death. Condition of the bones of the other skeleton of this burial was so bad that any guess, other than that the bones were those of an adult, would be hazardous.

Bones of the skeletons of Burial 3 were in a thin black zone at the base of the burial pit. Bottom of this pit, below the bones, was 23 inches below the present surface.

Burial 2 was fragmentary. Only the shafts of four long bones, part of a skull cap, and a small fragment of another bone were found. No teeth were present. Four of these bones were in the lower black deposit of the pit. Bits of calcined bone were also found in this black deposit and in the surrounding dark brown dirt. However, this was not a cremation as the human bones were not burnt nor charred. Possibly these bones were those of an individual whose remains had been brought to the site from some other place for reburial.

Bones of all burials were in extremely poor condition. Parts of some bones were entirely gone and others could be seen only as a streak of powder. Presumably this was the result of eating away of the bones by ground acids. Tests of soil samples, kindly made by Mr. Robert E. Spangenberg of the University of Florida, indicated a pH value of 6.0 for the dark loam and 6.2 for the yellow-brown loam. Samples from burial pits were not tested but it is evident from these pH values that the soil was very acid and that good preservation of skeletal material could not be expected at this site.

Pottery

Sherds from the Johnson's Spring site while numerous were very small. Nevertheless, four pottery groups or types could be distinguished on the basis of paste and decoration.

The most recent type had a noded collar (Fig. 18, upper). Sherds were gray to gray-brown in color and tempered with a fairly large amount of medium fine aplastic. This temper appeared to be sand as particles were rounded. Body sherds were extremely thin, only 3 mm., while those of the collar were thicker, 6 mm. Outer surfaces of body sherds were well smoothed but originally they bore cord or textile imprints. For this reason and because "coil-fractures" were not found, it is believed these vessels were shaped, or at least finished, by the paddle and anvil method.

Vessels had a globular body, constricted neck, and noded collar with basal notches. The lip of the collar was rounded and slightly bent outward so that the upper part of the outside of the collar was slightly concave. Bosses at the base of the collar appear to have been made by cutting away material with a thin tool. Slight depressions on the inside show where fingers had been pressed during this operation. Incisions on the side of the collar were made by means of a blunt tool and seem to have been carefully and confidently applied (Fig. 18, upper).

While 341 sherds of this type were found it is doubtful if they represented more than one vessel. Due to their small size and fairly wide distribution, it is believed this vessel broke during occupation of the site and was not left by an overnight camping party. These sherds, while concentrating in the northwestern part of the excavated area, were found as far to the east and south as Squares 4-L-P and 9-R. All of these sherds were uncovered in the narrow zone of dark loam. While present from the base of this zone upwards, their concentration was in the upper part, many actually being in the lower part of the soil.

Shell-tempered pottery was represented by sherds containing small slits and holes from which something, presumably shell, had leached. These sherds were light tan in color, medium thick (6 mm.), and predominantly undecorated. Four bore imprints of a cord-wound stick. Rim sherds exhibited flat, wide, undecorated lips. Sherds of this type were concentrated at the junction of dark loam and yellow-brown loam. Of 211 such sherds, 144 were in the lower part of dark loam and the balance at this junction or in the upper two inches of yellow-brown loam. When in the
dark loam they were associated with sherds of the vessel having a noded collar. However, their vertical distribution was deeper and they are, therefore, considered to be older. Their horizontal distribution was the same as that given for sherds of the collared vessel.

No temper could be discovered in an additional group of 24 sherds. These sherds had cord-malleated exteriors. They were found at the junction of dark loam and yellow-brown loam.

A third group of pottery was tempered with coarsely crushed rock, usually granite. Sherds were tan in color, frequently had a reddish cast, and were fairly thick, 6-10 mm. Of 155 sherds in this group, 11 were undecorated, 51 had cord-malleated exteriors, 56 bore imprints of rocker-like tools, 5 were incised, and 4 decorated with dentate marks. This pottery is similar to that of the Point Peninsular of New York State with which I believe it may be equated (See Ritchie: The Pre-Iroquoian Occupations of New York State, pp. 365-366 for an analysis of Point Peninsular ceramics).

Various rocker-like tools were used. The imprints of one consisted of fine lines, 2 mm. wide, forming arcs, 7 mm. long. These marks formed a design which unfortunately cannot be reconstructed. Rim sherds with this decoration on their sides had flat undecorated lips. In another case a tooth or dentated rocker, 1 cm. long, was used. Rim sherds of a vessel of this type are illustrated (Fig. 18, lower). Rows of rocker imprints were made parallel and more or less perpendicular to the rim, leaving broad undecorated panels. Scoring or smoothing marks were not always removed before applying the rocker-like tool. Vessels had slightly restricted necks and slightly everted mouths. Lips were flat but notched at both outer and inner edges. A close parallel between the illustrated vessel and similar ones of the Point Peninsular of New York lies in the fact that in both cases rocker imprints are to be found on the inner surfaces.

This third type of pottery was found in the yellow-brown loam over most of the excavated area. Only a half dozen sherds were found in dark loam. Otherwise sherds of this third group had a greater mean depth than that of shell-tempered pottery.

The last group of sherds to be mentioned were like those called Vinette Type 1 in New York State. This type of pottery is believed to be the earliest in both that area and eastern Massachusetts. The diagnostic feature of this pottery is that it is covered with cord-malleations on both the inner and outer surfaces. Vinette Type 1 sherds at the Johnson's Spring site were reddish-tan in color, heavily tempered with crushed granite, and contained many inclusions of mica. Walls were thick, 1 cm., and rims simple and rounded. Only a small amount of this pottery was found, all within ten feet of Square 7-P. Of 62 sherds, 9 could be definitely identified as Vinette Type 1. Inner surfaces of the balance were missing. Vinette Type 1 sherds were not particularly deep. When found in a square, they were the deepest pottery present. One was recorded for yellow-brown sand.

To recapitulate, the lowest pottery found at the Johnson's Spring site was Vinette Type 1. Starting at the same depth and continuing upward for a short distance was coarse mineral-tempered sherds with plain, cord-malleated, rocker, and dentate decorated surfaces similar to Point Peninsular pottery of New York State. This pottery frequently had notched lips. Partly associated with these sherds and partly associated with the next higher zone were shell-tempered sherds, predominantly undecorated and having flat lips. The highest and consequently the last pottery was thin, mineral tempered, and had an incised, noded collar.

**Projectile Points**

Shapes of projectile points are illustrated in Figure 19. Their vertical distribution is given in the following tabulations, first by zones in the ground and then by inches below the surface.

Seven of the large triangular points and one of the large side-notched points were made of material locally called "Saugus red Jasper" This material, probably a red felsite or rhyolite, is very distinctive and comes from an outcrop in Saugus about 7 miles south of the site. Two of the wide-bladed side-notched points were made of quartzite. All other points were of felsite, probably from the Lynn volcanics about 10 miles to the east and south. These materials must have been brought to the site as the only rocks naturally present are granitic.

<table>
<thead>
<tr>
<th>Type</th>
<th>Fig. 19</th>
<th>Dark Loam</th>
<th>Junc-brown Loam</th>
<th>Yellow-brown Sand</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large triangular</td>
<td>A-W</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Small triangular</td>
<td>E</td>
<td>2</td>
<td>2</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Side-notched, small</td>
<td>F-G</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Side-notched, large</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Side-notched, wide blade</td>
<td>J</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Eared elongate</td>
<td>K</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Eared triangularoid</td>
<td>L</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Pointed base</td>
<td>M-N</td>
<td>12</td>
<td></td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Corner-removed, spear</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

*One in dark brown dirt leading down from dark loam.
The second tabulation indicates that large examination usually about side-notched, large notched points were more closely associated with the shell- underlying yellow-brown loam. In considering the second tabulation it may be well to bear in mind that the base of dark loam was usually about 5½ inches below the surface. The second tabulation indicates that large triangular points were relatively deep in the dark loam. They were not, therefore, completely associated with sherds of the vessel having a noded collar. While some association between these points and sherds of this vessel may be assumed, large triangular points at the Johnson’s Spring site were more closely associated with the shell-tempered pottery which concentrated at the junction between dark loam and yellow-brown loam.

Further examination of these tabulations will reveal that sixteen out of eighteen side-notched points were found in yellow-brown loam and at greater depths than large triangular points. Side-notched points were closely associated with the mineral-tempered Point Peninsular-like pottery. Reasonably similar points are the most common type of projectile point at Point Peninsular sites in New York State (See Ritchie: The Pre-Iroquoian Occupations of New York State, Plate 167). Pointed base points and corner-removed spear points had the deepest average provenience. These corner-removed spear points and one of the pointed stem points were found in yellow-brown sand and at depths greater than that at which pottery was found. They are suggestive of a preceramic horizon and have been found at other sites in northeastern Massachusetts below pottery producing zones (See “The Foster’s Cove Site” and “An Indian Site in Andover, Massachusetts,” Vol. VII, No. 2, this series).

Other Artifacts

In the dark loam, associated with large triangular points, were two drills made of Saugus red jasper (Fig. 19, Q). Also in the dark loam, or at its base, were ten subnosed scrapers, three of Saugus red jasper and seven of felsite (Fig. 19, S-T). Two more, made of the latter material, came from the upper part of yellow-brown loam.

Three flake scrapers, flakes of which one edge had been delicately retouched for use as a scraper, came from the junction of dark loam and yellow-brown loam. Three other utilized flakes were also found.

Six small and four large asymmetric triangular knives were uncovered in yellow-brown loam (Fig. 19, O-P). All were made of felsite.

One small stemmed knife of felsite was found in yellow-brown sand (Fig. 19, R). The blunt end of this tool was rounded or smooth-ed, presumably as a result of use.

Two percussion flaked tools, found in yellow-brown loam, are worthy of comment. Both were made of felsite. One appears to be a crude knife or scraper (Fig. 19, U). The other is similar to a small flat ax. The top, basal edge, and sides are smoothed by rubbing (Fig. 19, V).

Fifty-two worked fragments or pieces of broken tools and six crude knives or unfinished specimens complete the inventory of chipped tools.

Felsite chips from the Johnson’s Spring site did not add greatly to the stratigraphic picture presented by pottery and projectile points. Felsite chips were, in general, only slightly patinated; those from the yellow-brown loam more so than those from the dark loam but the difference was hardly significant. The only specimens that seemed to be sufficiently patinated to warrant comment were corner-removed spear points, points with pointed bases, and the small stemmed knife. These were the deepest stone artifacts. The lack of differential patination in other stone artifacts is not surprising as those mentioned are the only ones representing a pre-ceramic horizon and might, therefore, be old enough to show much patination. This agrees with findings in the Shawsheen River valley where points dated as after the introduction of pottery do not exhibit appreciable patination.

Chips of Saugus red jasper, of which there were a great many, constantly occurred at a definite stratigraphic position. They were consistently found at and slightly above the junction between dark loam and yellow-brown loam as were tools made of the same
material. At this site, therefore, use of this material was later than Point Peninsular-like pottery and earlier than the vessel with a noded collar.

Five fragments of soft graphite or plum-bago were found in a narrow zone, 1½ inches thick, immediately below the junction between dark loam and yellow-brown loam.

A fragment of the bowl of an Indian pipe came from yellow-brown loam. It was made of clay which apparently contained no temper. The wall was 9 mm. thick. The inside surface was very smooth while that of the outside was covered with narrow scraping marks.

Another fragment of smoking paraphernalia was a portion of the stem of white clay pipe. It was found in dark loam, at a depth of 5 inches, among sherds of the vessel having a noded collar. Admittedly white clay pipe stems are difficult to date. However, this one was not recent as it had a relatively large hole. The outside diameter was 8½ mm. and the diameter of the hole 3½ mm.

If this specimen is properly associated with sherds of the vessel having a noded collar, and there is no reason to doubt the association, it would indicate that this site was used by Indians in post contact times. That this is quite likely the case is suggested by the fact that vessels of this type have been found in graves with historic goods (see Hadlock, "Three contact Burials from Eastern Massachusetts," Vol. X, No. 3 this series).

Food Remains

We have very little evidence of subsistence at Johnson's Spring. The only food remains preserved are five fragments of common clam shells, Mya arinaria, and tiny bits of calcined bone. The latter are usually presumed to be those of deer. The large number of projectile points suggest that hunting was an important part of the economy. It was suggested earlier that the site was situated in a location favorable to farming. Excavation did not disclose any evidence, with the possible exception of storage pits, which might imply the presence of agriculture.
The oldest remains are suggestive of a pre-ceramic period. They consist of pointed base and corner-removed spear points found in yellow-brown sand.

In the next higher zone, yellow-brown loam, occurred various side-notched points and asymmetric triangular knives associated with mineral-tempered pottery which was cord-malleated, rocker, and dentate decorated. Of this pottery that which was cord-malleated on both inner and outer surfaces, Yninnette type 1, had the deepest proveniences. Culture traits of this zone are similar to those called Point Peninsular in New York State.

Averaging shallower in depth and concentrated at the junction between yellow-brown loam and the overlying dark loam, were shell-tempered sherds with wide, flat rims and large triangular projectile points. This pottery is similar to that from the upper zones of the Hofmann and Foster's cave sites in Andover except for the substitution, at the latter sites, of vegetable tempering for crushed shell. At these sites, as at Johnson's Spring, large triangular points were associated with this pottery.

In the highest cultural zone were fragments of a vessel with thin walls and a noded collar. Associated with these sherds was a vessel with a white clay pipe stem. The latter appears to be from a relatively early pipe and may date the last occupation by Indians as after 1620.

Three burial pits were excavated. These pits had been dug from an elevation now represented by the upper part of the dark loam. They correlate, therefore, with the last occupation of the site and may be proto-historic in date.

Unfortunately data from Johnson's Spring, like that from most sites, does not permit much reconstruction of aboriginal life. We know that Indians lived, worked, and died near the spring. They made pottery containers for cooking and storage which they decorated in various ways. They also dug storage and burial pits. With the latter are the remains of fires suggesting funeral ceremonies. They constructed stone pavements and a stone fireplace. They must have had some form of shelter. Indians brought to the site stone from which they fashioned projectile points and other tools to assist them in the procurement and preparation of food. With some of these tools they no doubt made objects of wood and bone.

Additional excavation would be expected to add substantially to our knowledge and understanding of Indian life at Johnson's Spring.
for its most prominent mineral, as mica schist or hornblende schist.

Granite - a mottled igneous rock usually composed of feldspar, quartz, and mica.

Gneiss - a metamorphic rock similar to granite in composition but with its minerals separated into crude bands.

Syenite - another rock which resembles granite but contains little or no quartz. Since this rock is softer and easier to work, it was used much more than granite by the Indians.

Diorite - a granitic rock containing such dark minerals as hornblende, pyroxene, and black or brown mica.

Argillite - a dense variety of slate or indurated shale usually containing tiny flakes of mica.

Porphyry - which is any rock containing distinct crystals of light colored feldspar imbedded in a darker matrix.

None of these rocks was suitable for chipping into projectile points or other small artifacts though apparently the Indians were occasionally forced to do the best they could with some of them. The most desirable material for such purposes was quartz, a common mineral chemically known as silicon dioxide or silica and occurring in many varieties, the names of which have been and still are much confused. Charles C. Willoughby recognized this fact when he wrote in his Antiquities of the New England Indians, "The term flint, as commonly used by American archaeologists, is broadly applied not only to flint proper but to other silicious stones of great hardness and of many colors, including chert, jasper, and chalcedony."

But, with the tendency of modern science, including that of archaeology, to dispense with misleading terms and to be as accurate as possible in the naming of all substances, Mr. Willoughby’s statement leads to several questions: What is flint proper? How does it differ from chert, jasper, and chalcedony? And how does each of these differ from the others? For his answers the archaeologist naturally turns to test books on mineralogy -- and he finds that few of them agree on the definitions of these minerals. In fact most of the books are so vague in their descriptions of quartz varieties that they are of little value to either the archaeologist or the mineralogist himself.

However, some modern mineralogists are beginning to attack the problem of a logical classification of quartz varieties and the consensus among them is that the origin and the structure of the substances should be considered as the bases of their identification. Flint, we are told, is an intimate mixture of amorphous quartz and opal which occurs in the form of nodules and concretions of irregular shape in chalk or limestone. It was formed on the ocean floor by the chemical deposition of siliceous matter around coral centers and much of it was derived from the silicious skeletal parts of sponges, radiolarians, and diatoms, some of which can still be recognized in the mineral with the aid of a microscope. Chert, on the other hand, though chemically identical to flint and also amorphous, was apparently formed by the silification of limestone plus in some places a deposition of silt from a colloidal solution. Both flint and chert are of granular structure.

True flint, it seems, is by no means common in this country and most of the so-called flint, including that at Flint Ridge in Ohio, is really chert. The only way then to be absolutely sure whether a given artifact is made of flint or chert is to examine a thin slice of the material with a microscope and thus by a study of its grains determine its origin.

Chalcedony is a cryptocrystalline variety of amorphous quartz which includes such sub-varieties as agate and jasper. The term chalcedony itself is usually applied to the material of a translucent white or grey color; agate to chalcedony which shows patterns or bands of color; and jasper to the opaque variety.

If we are to abide by these definitions, it is doubtful that true flint was ever available to the Indians of New England and therefore most of the material which looks like flint and is of the same hardness (i.e. 7 on Moh’s scale) should properly be labeled chert or jasper. The structure of the latter is revealed by the microscope as definitely fibrous. Black, red, brown, and yellow jasper occur in widely scattered localities in New England but white chalcedony and agate are very rare.

Such well known and easily identified crystalline quartz varieties as crystal or vitreous quartz, smoky quartz, milky quartz, and fergusonite quartz, as well as quartzite (which is really a rock) were available to the Indians in all parts of New England, and while none of these could be as easily or as beautifully worked as the amorphous varieties they were much more easily obtained and were widely used. White or milky quartz points are especially common in southern New England.

Two rocks which were much used by the Northeastern Indians for points and blades and which are often confused with quartz minerals are felsite and hornfels. Both of these have imperfect conchoidal fractures and both are somewhat softer than quartz. Felsite is a hardened lava, usually a light shade of pink, red, brown, buff, purplish, or green; is frequently marked with spots or narrow veins; and is friable.

2. Cryptocrystalline - Term applied to crystalline rocks whose crystals are too fine to be seen.
and is more common in the eastern than in the western part of New England. The famous Mt. Kineo material is a fine grade of porphyritic felsite.

Some archaeologists may desire to be more specific in the cataloging of their specimens than such a general term as felsite will permit. For such, a division of this rock into some of its sub-varieties is suggested. The most common of these are: rhyolite, a light gray, pink, red, or brown felsite, often containing phenocrysts (5) of quartz, sanidine, or obsidian; trachyte, similar to rhyolite but containing no quartz; phonolite, a gray or green variety showing a slabby parting; andesite, a quartz andesite, the ground mass of which is usually pale brown or yellow.

Hornfels is a very dense rock produced by the igneous metamorphism of clay, shale, slate, or impure limestone. It is found near hardened rock intrusions in many parts of the world. The colors range from light gray and pale green to dark gray. Large pieces of what seems to be hornfels have been found in the vicinity of Pelham, Massachusetts, and one recently in West Springfield. Several points in our collections appear to be made of this material.

Sandstone and slate, each of which is a readily identified rock and very plentiful in certain sections of New England, were extensively used by our Indians for various artifacts. Slate, as is well known, was the favorite material for extremely long and slender points, banner stones, semi-lunar knives, gorgets, and ceremonial objects.

BIBLIOGRAPHY


3. Phenocryst - A prominent embedded crystal in a porphyry.