

## Geology of the Sheguiandah Early Man Site: Key Concepts and Issues

## Géologie du site préhistorique de Sheguiandah : problèmes et résultats obtenus

## Geologie des prähistorischen Fundorts von Sheguiandah: Schlüsselvorstellungen und Resultate

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Article abstract

The first indication that man was present in Canada well before the final retreat of glacial ice was found at the village of Sheguiandah, on Manitoulin Island, Ontario, in the early 1950s. This paper summarizes the relevant evidence and arguments. The key deposits are two thin layers of diamicton toward the top of the glacial sequence, immediately below a post-glacial level characterized by Paleo-Indian projectile points. The unsorted mixtures of clay, sand and stones contain undisputed quartzite artifacts. These diamictons are considered to be till; alternatives, such as mixing by frost action and mud flows, do not explain their origin. The means by which the artifacts survived the Laurentide glaciation are suggested by the orientation and dip of the pebbles. Apparently diverted from its normal direction of flow by a tough quartzite knob, the ice lacked much erosive power at this point, only transporting the artifacts from one part of the site to another. Geological interpretation indicates that man made the artifacts now found in the tills during Early Wisconsinan interstadials. Other evidence, in the form of prehistoric quarries, pollen analyses and radiocarbon dating, supports the published age estimate of more than 30,000 years BP.

## Essai

# GEOLOGY OF THE SHEGUIANDAH EARLY MAN SITE: KEY CONCEPTS AND ISSUES\*

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**ABSTRACT** The first indication that man was present in Canada well before the final retreat of glacial ice was found at the village of Sheguiandah, on Manitoulin Island, Ontario, in the early 1950s. This paper summarizes the relevant evidence and arguments. The key deposits are two thin layers of diamicton toward the top of the glacial sequence, immediately below a post-glacial level characterized by Paleo-Indian projectile points. The unsorted mixtures of clay, sand and stones contain undisputed quartzite artifacts. These diamictons are considered to be till; alternatives, such as mixing by frost action and mud flows, do not explain their origin. The means by which the artifacts survived the Laurentide glaciation are suggested by the orientation and dip of the pebbles. Apparently diverted from its normal direction of flow by a tough quartzite knob, the ice lacked much erosive power at this point, only transporting the artifacts from one part of the site to another. Geological interpretation indicates that man made the artifacts now found in the tills during Early Wisconsinan interstadials. Other evidence, in the form of prehistoric quarries, pollen analyses and radiocarbon dating, supports the published age estimate of more than 30,000 years BP.

**RÉSUMÉ** Géologie du site préhistorique de Sheguiandah: problèmes et résultats obtenus. Le premier indice de la présence de l'homme au Canada avant le retrait définitif des glaciers a été découvert à Sheguiandah, dans l'île de Manitoulin en Ontario, au début des années 50. On rassemble ici les principales preuves et les arguments en faveur de cette présence. Les principaux dépôts consistent en deux minces couches de diamicton sus-jacentes à une séquence glaciaire et sous-jacentes à un niveau postglaciaire contenant des pointes de projectiles paléo-indiens. Les dépôts, composés d'un mélange d'argile, de sable et de cailloux, contiennent indiscutablement des objets témoins de quartzite. On considère ces diamictons comme étant des tills. D'autres explications, comme l'action du gel et la solifluxion ne rendent pas compte de leur origine. L'orientation et l'inclinaison des galets expliquent la présence des objets témoins, malgré le passage des glaciers. Il semble que le glacier, probablement détourné de son cours par une bosse de quartzite très dur, ne fit que transporter les objets d'une partie du site à une autre. Selon les données géologiques, il semble que les objets aient été fabriqués au cours d'interstades qui ont précédé le Wisconsinien supérieur. D'autres preuves, comme la présence de carrières, l'analyse pollinique et une datation au radiocarbone, corroborent la valeur de la date estimée à plus de 30 000 BP.

**ZUSAMMENFASSUNG** Geologie des prähistorischen Fundorts von Sheguiandah: Schlüsselvorstellungen und Resultate. Der erste Hinweis auf menschliches Leben in Kanada lang vor dem Rückzug des glazialen Eises wurde im Dorf von Scheguiandah gefunden, auf der Insel Manitoulin, Ontario, in den frühen fünfziger Jahren. Dieser Artikel faßt die relevanten Anhaltspunkte zusammen. Die wichtigsten Ablagerungen sind zwei dünne Schichten von Diamikton in Richtung der Spitze der glazialen Sequenz und direkt unterhalb eines postglazialen Niveaus, welches Spitzen von Paleo-indianischen Wurfgeschossen enthält. Die ungeordneten Mischungen aus Lehm, Sand und Steinen enthalten unbestreitbar Artefakte aus Quarz. Man hält diese Diamiktone für Grundmoränen; Alternativen, wie z.B. Mischung durch Frosteinwirkung und Schlammströme, erklären ihre Entstehung nicht. Die Orientierung und Neigung der Kiesel lassen vermuten, wie diese Artefakte die Laurentische Eiszeit überlebten. Das Eis wurde offensichtlich von seiner normalen Flußrichtung durch eine harte Quarzkuppe abgelenkt und verlor an dieser Stelle sehr viel Erosionskraft, so daß es die Artefakte am Fundort nur von einer Stelle zur anderen trug. Die geologische Interpretation zeigt, daß der Mensch diese jetzt in den Grundmoränen gefundenen Artefakte während der Interstadiale, die dem späten Wisconsin vorausgingen, angefertigt hat. Andere Beweise, wie prähistorische Steinbrüche, Pollenanalysen und Radiokarbondatierungen stützen die auf mehr als 30,000 Jahre v.u.Z. geschätzte Datierung.

\* Contribution du premier symposium de la CANQUA, sous la direction de René W. Barendregt.

The question of when man first arrived in the New World is probably the most contested issue in North American archaeology. For many decades the prevailing view, almost a doctrine, has been that the first inhabitants were Paleo-Indians, and that they arrived south of the continental ice sheet at the end of the Wisconsin glacialiation, about 12,000 years ago. Since the late 1940s a small number of very much older sites have been reported, but reaction has been so intensely critical that investigation has been retarded by bitter controversy.

But attitudes are softening. In discussing the initial peopling of the New World, WORMINGTON (1983, p. 195) summarized her opinion with the following statement: "If I were to be asked what the main change would be ten years from now, I would again say that we would have generally acceptable evidence of human occupation considerably earlier than we have now." She nevertheless immediately added, "Once again, I might be completely mistaken." The interesting state of uncertainty expressed by Wormington three years ago still prevails in this field today.

It has become fashionable to determine acceptability by reference to set criteria. STANFORD (1983, p. 65), for instance, suggested that the interpretation of all the localities proposed as having been inhabited in Wisconsin times was problematic because they lacked the following: "(1) a clearly defined stratigraphy, (2) reliable and consistent radiometric dates, (3) consonance of data from relevant interdisciplinary studies and (4) the presence of unquestionable artifacts in an indisputable primary context."

One of the very first Early Man localities discovered, the Sheguiandah Site, is the subject of this essay, in which arguments are brought forward to support the antiquity of artifact-bearing beds. Inasmuch as Sheguiandah has escaped careful attention by Wormington and Stanford, the reader may wish to keep in mind the four basic criteria cited above.

The Sheguiandah Site was found by Thomas E. Lee in 1951 (LEE, 1953). This paper summarizes the history of the site, the work done there, and the results obtained. More exhaustive descriptions of the site's geological and archaeological features can be found in LEE (1957, 1964, 1979) and SANFORD (1957, 1971).

The site occupies a 10-hectare hilltop above the village of Sheguiandah, Ontario, on the eastern end of Manitoulin Island in Georgian Bay. From 1952 through 1955 Lee directed excavations there for the National Museum of Canada, with crews of up to 25. Where the volume of artifacts exceeded that of the soil, excavation proceeded piece-by-piece; otherwise, the soil was scraped away in one-inch levels by trowelling, with the exact depths of each specimen being recorded. In the course of this work more than 60,000 archaeological specimens were placed in the Museum, where they may be studied today. A sequence of at least five cultural levels was found, but only the three most recent could be assigned to the 12,000-year span then allowed for man's presence; the older levels lay in and under glacial deposits (Fig. 1). Several geologists were closely involved with the investigation, including Bruce Liberty and Jaan Terasmae, both of the Geological Survey of Canada, the late Ernst Antevs, of Globe, Arizona,

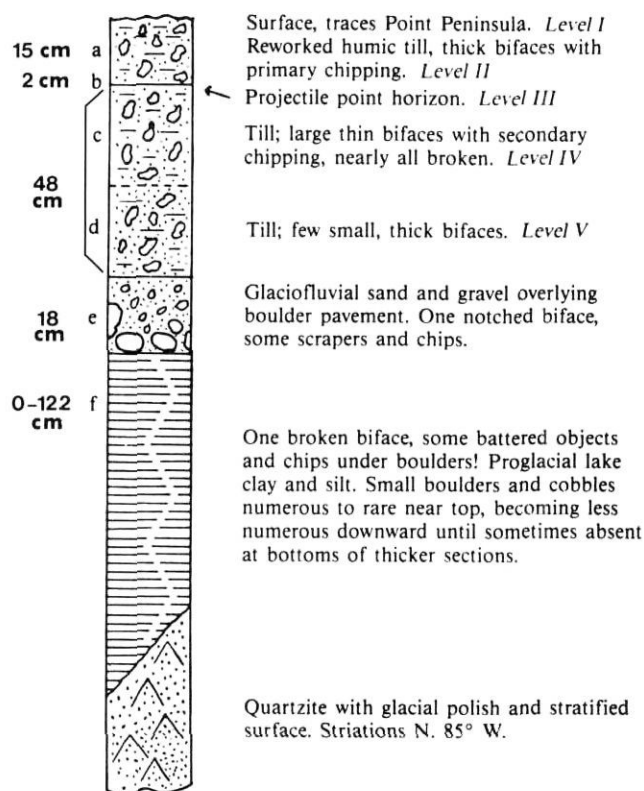


FIGURE 1. The stratigraphy of the Habitation Area, Sheguiandah Site (adapted from SANFORD, 1957 and LEE, 1957).

*La stratigraphie de la zone d'habitation du site de Sheguiandah (adapté de SANFORD, 1957 et LEE, 1957).*

and especially John T. Sanford, of Wayne State University, Michigan<sup>1</sup>.

## THE POST-GLACIAL CULTURES

The surface indications of man at Sheguiandah were extensive (LEE, 1953, 1957). Whole ridges of high-quality quartzite had evidently been broken down by prehistoric peoples, leaving vast quantities of rubble. There had been virtually no soil formation on much of the rubble, which had spilled downslope from the quarries in masses as much as 70 m across and several metres deep. Great numbers of finished artifacts were incorporated in this debris, but projectile points were entirely absent from the materials of this culture (cultural level II). Instead, large, bifacially flaked quartzite artifacts weighing as much as a kilogram each were characteristic. These bifaces were closely related to George Lake I materials (GREENMAN and STANLEY, 1943); as LEE (1974) has pointed out, they have also been erroneously assigned to the Shield Archaic (STORCK, 1974). These same cultural materials were also found at half-a-dozen other nearby sites on Manitoulin Island, but only at or above the elevation of the Great Lakes Nipissing shoreline. At Sheguiandah this prominent feature

1. Like Antevs, both of the original investigators are also deceased, John T. Sanford in 1981 and Thomas E. Lee in 1982.

formed the lower limit of the site. The association with the Nipissing shore showed that the heavy bifaces were about 5000 years old.

Where soil was present, on a bench part way down the relatively gentle eastern slope of the hill, the heavy bifaces attributed to level II occurred in a shallow surface zone constituted of equal portions of humus and man-made materials (Fig. 1a). The abundance of small tools, such as scrapers, graters, and knives, together with heavy use-wear on the big bifaces (LEE, 1954, p. 110), all in the only place suitable for a village, gave rise to the name Habitation Area (LEE, 1964).

At a depth of approximately 15 cm a silty deposit (b), distinct from the humus, was revealed. Because the thickness of this orangish, powdery sediment seldom exceeded 2.54 cm the geologists on the site termed it a horizon. It yielded the only projectile points ever found on the site (cultural level III); these actually had a variety of cultural affiliations, ranging back in time from Laurentian points of the Archaic to both fluted and unfluted points of the Paleo-Indians, who are presumed to have been the first peoples to enter Ontario upon the retreat of the last Wisconsin glacier. LEE (1972, p. 28) proposed that the powdery deposit represented wind-blown soil from the time when the waters of glacial lake Algonquin, which had washed against the retreating ice, fell far enough to expose large areas of unvegetated lands to the wind.

### EARLY-MAN CULTURES

Lee carried the excavations into deposits below the Paleo-Indian level because man-made objects continued to appear in the trenches. The uppermost of these deposits was an unsorted mixture of clay, sand, small stones and boulders (Fig. 1c and d). This material was first identified as glacial till in primary position by Sanford (in LEE, 1955, p. 70).

*The artifacts of two very different cultures were present in the till; the large, thin bifaces of level IV being in the upper half and the small, thick bifaces of level V in the lower (Fig. 2). This suggested that there were actually two phases of till, each about 25 cm thick. Although the archaeological crews, who were digging with trowels, could distinguish the two layers, the differences would not be immediately obvious to a casual observer.*

SANFORD (1957, p. 142) approached the problem by treating the artifacts of the two cultures as if they were fossils. Working separately, he and Lee also discovered both qualitative and quantitative (sediment-size distribution) differences between the upper and lower deposits. Furthermore, the lower till phase was found to include small patches of clean sand, such as would be incorporated into glacial ice as frozen lumps, and large blocks of shale; these were lacking in the upper layer. The conclusion that there were two parts to the unsorted deposit figured significantly in the argument over their glacial origin.

As the digging continued below the till an impressive boulder pavement was revealed (Fig. 3). The individual stones, which lay edge to edge, were as much as a metre across. They rested in a 10-cm-thick deposit of well-sorted, coarse sand

identified as meltwater deposits from nearby glacial ice. Initially, the boulders and the sands were treated practically as if they formed a single unit (Fig. 1e), but in later years SANFORD (1971, p. 6) considered them to represent two distinct geological events.

As artifacts continued to be found, the boulders were lifted. More artifacts were found in other deposits beneath them. These were much-battered objects, with the exception of one broken biface; their characteristics were not sufficient to indicate any cultural affiliation. These artifacts lay in the upper portions of partly stratified silts and clays (f) that continued down to the glacially polished bedrock, more than a metre below. The uppermost laminations were reddish, and in many places showed considerable disturbance (Fig. 4). The geologists on the site concluded that the clays represented an ancient proglacial lake.

### OTHER EVIDENCE FOR ANTIQUITY

#### THE SWAMPS

Four small swamps near the crest of the hill were drained and trenched. The peat in one was more than 1.5 m thick, and it contained a few artifacts that had demonstrably been tossed into the swamp at various times while the peat was forming (LEE, 1955, p. 67). Pollen analyses carried out by Jaan Terasmae showed vegetation changes believed to represent such events as the Cochrane glacial readvance (in LEE, 1957, p. 118). A sample of the basal 2.54 cm of peat was submitted to the U.S. Geological Survey for radiocarbon dating: it gave a radiocarbon age of  $9130 \pm 250$  years BP (W-345) (LEE, 1956). The peat in that sample would have been the product of the first swamp plants to grow after the retreat of the ice and the fall of glacial Lake Algonquin.

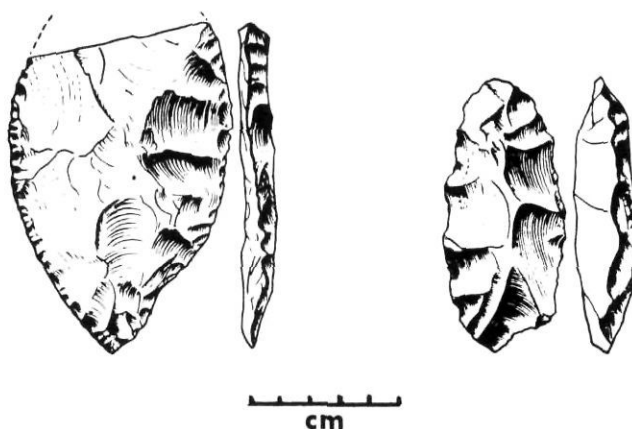


FIGURE 2. The quartzite artifacts from the upper till (left) are large, very thin bifaces showing secondary flaking along the edges; those from the lower till (right) are typically small and thick and show only the broad, deep scars of primary flaking.

*Les objets témoins de quartzite du till supérieur (à gauche) comprennent surtout des bifaces minces et larges; leurs arêtes portent des traces de retouche; les bifaces du till inférieur (à droite) sont typiquement courts; ils ne portent que des traces profondes de façonnage.*





FIGURE 3. Boulder bed with meltwater sands and section of overlying till.  
*Lit de blocs dans des sables fluvio-glaciaires et coupe du till sus-jacent.*

FIGURE 4. Test trench to bedrock, showing disturbance of proglacial lake clays (above yardstick) and overlying till.

*Tranchée jusqu'à la roche mère montrant les argiles lacustres proglaciaires perturbées (au-dessus de la règle) et le till sus-jacent.*



Underlying the peat were strongly disturbed clays of unknown origin. These clays contained chunks of naturally broken rock, as well as artifacts. They lacked laminations. This layer was variously identified as till, glacial outwash, and a frost-action deposit. The artifacts were not distinctive enough to allow correlation with the cultural sequence of the Habitation Area, but must date to more than 9130 radiocarbon years.

The basin that held another of the swamps was found to be man-made, rather than natural. The clays and peat there were filling an abandoned prehistoric quarry, which must have been used before the close of the Wisconsinan.

#### QUARRIES

Excavation of one small area of quartzite rubble revealed a rectangular quarry, 4 m long and 3 m wide, that had been cut 1 m straight down into the bedrock. After the trench had been backfilled Bruce Liberty remarked to Lee that he had seen a glacial chattermark on the quarry floor (in LEE, 1979, p. 88). Startling as the observation was, the implication that the quarry preceded at least one advance of glacial ice was supported by the way the quarry had been filled in prehistoric times. First a reddish diamicton had spilled into the quarry; this material contained thin bifaces of the type elsewhere found only in the upper layer of glacial till (cultural level IV) (LEE, 1954, p. 107). The quarry had later been completely hidden by the debris of cultural level II.

Small quarries were also discovered in the bedrock underlying glacial till in the Habitation Area.

#### THE IDENTIFICATION OF THE TILLS

Sheguindah presents many complex problems for both the archaeologist and the geologist. Some of these were resolved by the excavations, which were increasingly aimed at finding specific answers. Ironically, as Sanford once pointed out, the one set of deposits that came to be most fully understood has been the focus of the greatest controversy. The major criticism directed against the Sheguindah Site, in 1985 as it was in 1955, can be paraphrased thusly: "If there are artifacts, then those deposits cannot be glacial till!"

In part, this attitude derives from the persistent myth that a glacial advance would destroy any trace of man in its path. But some of the antipathy for glacial till at Sheguindah has a much deeper basis, for till implies a Pleistocene age for the site. Such an age flies in the face of the 12,000-year limit that has long dominated archaeological thinking, and makes Sheguindah a pivotal site in New World archaeology.

How was the diamicton in the Habitation Area (Fig. 1c and d) determined to be till? Sanford's initial identification had been made on the basis of careful visual inspection. The appearance of the deposit was so distinctive that nearly 100 geologists who visited the site in the 1950s interpreted it the same way. Upon being informed that artifacts were present, however, many of them became rather wary and advanced other possibilities. Thrashed out in the field, these arguments always led back to the initial conclusion: glacial till in primary position.

The deposits in question were unsorted. Alternative agencies that can produce such mixtures of clay, sand and boulders were considered and ruled out. Human activity was plainly not responsible. Mixing of artifacts from above with till below, whether by tree-throwing, burrowing animals, or frost action, could not have taken place without disturbing the Paleo-Indian horizon on top of the till — and the projectile points associated with that horizon were never significantly out of place. Then, too, any such mixing would also have disturbed the stratigraphy of the two tills. The most often repeated argument against antiquity was that solifluction or mud-flow debris is too readily confused with till. SANFORD (1971, p. 14) responded with a detailed explanation of how “the evidence indicates that *this agency [mud-flow] cannot be considered seriously at this locality*” (italics Sanford’s). Some of this evidence follows.

The fact that the Sheguiandah Site is on a hilltop is here extremely significant because the possible sources of mud for mud-flow are therefore necessarily limited. There is indeed slightly higher ground on the hill, but it is blocked off from the bench where these diamictos were found by several transverse ridges of quartzite (LEE, 1957, p. 70). In the face of this obstacle one geologist (in LEE, 1979, p. 88) proposed that mud from that higher ground could have flowed out around the end of the ridges and then doubled back into the Habitation Area. The latter part of this hypothetical action, however, would entail a slight uphill movement as well as flow over a level distance of 100 m.

Sanford considered the fact that there were two thin unsorted deposits a compelling argument against mudflow. It seemed to him impossible that a mud flow just 25 cm thick, as was either till, could have carried along boulders up to 45 cm in diameter without any significant slope, yet such boulders were present in the till.

As a final argument, Ernst Antevs (in LEE, 1979, p. 88) observed that you cannot have mudflow when you cannot make mud. The Habitation Area deposits were so well drained that the trenches did not hold water even in the heavy rains of summer.

But the till was also identified by positive means. The unsorted structure was verified by sediment analysis (in LEE, 1979, p. 87). Many of the stones were striated, and the orientation and dip of elongated pebbles were consistent with ice movement from the east-northeast.

## INTERPRETATIONS

The author has gone through many of the records of the time. The correspondence and notes of the early years, as well as some publications (LEE, 1955, p. 70) show that Lee and Sanford began by making an earnest effort to fit their findings into the conservative chronological framework then most acceptable. They tried to explain the till as the result of a minor glacier readvance after Lake Algonquin. But they quickly learned that no such readvance had reached Manitoulin Island.

In his first major paper on the site, therefore, SANFORD (1957) accepted the tills as representing pre-Recent events.

He reasoned that the origins of the earliest artifacts must therefore be sought at least as far back as a relatively warm interval in the Wisconsinan. The artifacts in the proglacial lake clays (Fig. 1f) could have been pressed into these sediments by floating icebergs. Ice-rafting in this same lake, he suggested, might have been involved in producing the boulder pavement. The meltwater deposits lying among the rocks of the boulder pavement (e) would represent material from an advancing ice sheet — perhaps the same ice sheet that subsequently deposited the first artifact-bearing till. In his concluding comments SANFORD (1957, p. 144) wrote that “A date of an order of magnitude of 30,000 years B.P. [for the artifacts] ... which has been suggested ... may be far too conservative.”

More than a decade later SANFORD (1971) reevaluated the existing knowledge about the Sheguiandah Site. Increased understanding of the regional geology had made it clear that Manitoulin Island would have been under either ice or glacial lake waters throughout the Late Wisconsinan glaciation and interstadials, thus barring occupation of the site in those times. The artifacts within the tills were, therefore, most probably made early, rather than late in the Wisconsinan. He now considered that the formation of the boulder pavement could not be explained by ice-rafting alone, and believed that it might well represent a former body of till that had been almost completely eroded away. The possible interposition of yet another ice advance in the sequence, he felt, could push the cultural origin of the artifacts in the still deeper clays far back into the very Early Wisconsinan, if not indeed the Sangamon interglacial.

## IMPLICATIONS

Most Early Man sites appear to be in alluvium. The Sheguiandah Site, as indicated above, is an exception. The thoroughness with which the till at Sheguiandah was investigated sheds some light on the question of how the artifacts there survived glaciation.

First of all, as noted above, the lower till contained blocks of soft shale; these should have been destroyed if carried very far. They thus appear to be of very local origin. Similarly, the relatively delicate artifacts of the upper till, though usually broken, bore no traces of the crushing and grinding that typically occur in a glacial advance. It would seem, then, that the shale and the artifacts were not transported any great distance, but were instead picked up on one part of the hill and deposited on another.

Secondly, glacial erosion was weak, with the ice over-riding the older deposits, rather than removing them. One significant feature on the site was a long ridge curving around the Habitation Area. This was an extremely weathered conglomerate of quartzite boulders in a dolomitic matrix. As it lay directly across the path of the glacier it should normally have been removed, yet it was not.

Thirdly, the orientation and dip of elongated pebbles in the tills showed that the ice had deviated from its normal southerly direction of flow, swinging westward in the lee of the tough quartzite knob that makes up the hill. It was the special cir-

cumstances of local control of the ice by topography that enabled the early components of the Sheguiandah Site to survive incorporation into and burial by later glacial till.

For many years LEE (1957, p. 123; 1979, p. 87) found no American parallels for the distinctive artifacts from the tills, but like other Early Man investigators working with unknown cultural materials, remarked on the resemblances to the Paleolithic assemblages of Europe. In 1982, however, he perceived considerable similarities in collections made from old land surfaces in the western United States (footnote to SHARP, 1982, p. 7). Unfortunately, these latter collections have not yet been dated.

Some archaeologists, apparently unable to come to grips with the geological conclusion that artifacts were found in glacial till, have tried to sidestep the problem by creating a false issue, calling Sheguiandah a mere "quarry site" or, to take an extreme, by seeking to dismiss it as a "nonsite" (GRIFFIN, 1979, p. 46). In essence, they are arguing that a site without an apparent living floor is not worthy of examination. Such a dogmatic position deprives us of the wealth of entirely new information to be gained from a study of the cultural features, lithic technology and use-wear pattern exhibited by the specimens. And since the whole controversy revolves around the possible presence of man in remote times, any indisputable trace of man in well studied deposits is obviously of the greatest importance.

Archaeologically and perhaps geologically unique, the Sheguiandah Site still does not stand alone as evidence of man's presence in an early period. On the contrary, geologically diverse evidence from a number of other Early Man sites suggests comparable ages. To name but three in California alone, there is the Texas Street Site (CARTER, 1957, 1980), the Brown Site (MINSHALL, 1981), and the Calico Site (SCHUILING, 1972, 1979; SIMPSON, 1982), all of which are believed by some to be early Wisconsinan or older.

Whether one favours the fixed criteria cited at the beginning of this paper, or the evaluation of logical possibilities employed by Sanford, one is led toward the probability that the oldest cultural materials at Sheguiandah are middle Wisconsinan or older in age. This implies the presence of man south of the continental ice at a very early date. The antiquity proposed for the Sheguiandah Site suggests that Pleistocene deposits currently considered "too old" for man merit persistent archaeological attention.

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