Sourcing of an Unidentified Chert from Western Wisconsin Paleo-Indian Assemblages

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ABSTRACT

A number of Paleo-Indian artifacts found in Western Wisconsin lithic assemblages were observed to be made of an unidentified olive green colored chert. A macroscopic examination of these artifacts, and comparison with known possible sources suggested that the material might be Silurian Chert Type II from the Door Pennisula in eastern Wisconsin. Attributed analysis and comparison with lithic debris found at sites in that area supports this hypothesis.

INTRODUCTION

Investigations during the 1990's documented several occurrences of a previously undocumented stone (lithic) material in Paleo-Indian artifact assemblages in western Wisconsin. This fine-grained, olive green material appears to be distinct from known local sources. The absence of lithic debitage from local sites reinforced a hypothesis of a non-local origin. Paleo-Indians were highly mobile, repeatedly visiting sources of high quality lithic raw material to replace worn tools (Mason 1997). Tracking the source of these tools enhances understanding of the movements and trade patterns of Wisconsin's first inhabitants.

As of May 2002, Mississippi Valley Archaeology Center (MVAC) was curating eight olive green chert artifacts, and at least two others are in the possession of private collectors. Four of these were found in the vicinity of Silver Mound, an outcropping of silicified sandstone located in Jackson County, WI, near the town of Hixton. The presence of olive green artifacts at Silver Mound suggests that the tools may have been discarded as native groups stopped to retool. The Silver Mound assemblage consists of three relatively large end scrapers, and a graver. Three other artifacts are a part of the Gary Steel Collection curated at MVAC. This assemblage consists of two drills, and the base of an Agate Basin projectile point. In addition, two flake knife/scrapers were obtained on loan from private collectors from other sites in western Wisconsin. MVAC lso curates an intact Agate Basin point that was found outside of West Salem at the site 47Lc694. Agate Basin points are distinctive of Late Paleo-Indian hunters. Large scrapers are also common to Paleo-Indian cultures (mason 1997).

Initial observations suggested the olive green chert is similar to Silurian Chert Type II, as defined by Toby Morrow and Jeff Behm, found on the Door County Peninsula along Lake Michigan. Behm and Morrow (1996) defined this chert as ranging from light gray to light bluish gray and greenish gray, often with faint linear banding, medium to medium fine in texture, of dull to satiny luster, and typically free of inclusions. In addition, the MVAC comparative lithic raw material collection contains olive green-gray chert collected from the west shore of Door County that most likely represents Silurian II Chert. This appears to be the most likely match for olive green chert represented in MVAC's artifact collection.

This paper presents the results of a chert identification analysis to test the hypothesis that the olive green Late Paleo-Indian artifacts found in Western Wisconsin are manufactured from Silurian II Chert that originated from the Door County Peninsula. This research was supported through an undergraduate research grant from the University of Wisconsin-La Crosse.

Methods

In order to documents the quantitative and qualitative characteristics of the greenish chert, a systematic process was established following Behm and Morrow (Behm and Morrow 1996). This is based on examination ofsix macroscopic attributes including translucency, color, color pattern, inclusions, texture, and luster.

Translucency is the sole quantitative attribute. Translucency is the degree to which light can penetrate a material, and is measured in the maximum thickness that light can noticeably penetrate. The material was held approximately one foot from a 100 watt light and using a digital calipers, the greatest thickness that light could be discerned was measured in mm.

Qualitative measures consist of observed traits in the material, such as color, inclusions, color pattern, texture, and luster. Color is one of the least diagnostic means of identifying a material, though the color of the artifacts in question is quite distinctive. Some materials show a very restricted color range but most do not. Other factors, such as heat treating, may change the chroma of even the most distinctive material. Patination, exposure to the elements for many years, can also alter the surface color of a material. The Munsell color chart was used to standardized the recordation of color in artifacts examined. Color in this system consists of three aspects: hue, value, and chroma. Hue is the general color, chroma the intensity of that color, and value is the lightness or darkness of the color. The color of the 'green' material is quite distinctive, and was the means by which it was originally recognized as unusual. However, once other characteristics could be ascertained, color proved to be less of a determinant attribute.

Color pattern can often be more distinct than color itself, and several general categories of color pattern were examined. Broad mottling consists of large irregular blotching, marbled mottling of irregular large blotching with greater swirling, and speckling of small irregular splotches. Banding of colors may occur horizontally or in concentric circles, from a central point. Streaking is a less regular, wider, form of banding. Speckled streaking is an even more open form of banding; a combination between speckling and banding. Artifacts seldom fit any of these categories exclusively, and notes describing individual patterns are frequently needed. Often, more than one color pattern is be evident on samples.

The size of the particles that make up a material is its texture. Coarse materials have large and noticeable grains, and individual particles can be easily discerned. Medium-grained chert is smoother, but a fingernail will grate detectably when drawn across it. On fine-grained materials, the fingernail will not ense resistance. A quick macroscopic examination will usually reveal the general size of particles, and dragging a fingernail across the material's surface aides in clarifying texture.

The degree to which light is reflected by a material's surface is its luster. A dull luster has minimal reflection. Waxy lustered pieces have a slick look. Intermediate between dull and waxy is a satiny luster. Luster is best determined by examining an artifact in good light.

Finally, inclusions such as fossils are often highly characteristic of specific lithic materials. Determined by their geological origin, inclusions are highly indicative of material source.

Certain inclusions are particularly diagnostic of certain materials found in Wisconsin. Brachiopods are a type of bivalve mollusk, and parts of their shells are frequently found in Wisconsin cherts. Bryzoans form lacy colonies that can be seen in Burlington chert from southeast Iowa. Crinoid columns, seen as long shafts or in round cross section, appear in several types of chert including Burlington. Fusilinids have a small rice like form and have a snail shell like appearance in cross section. Solitary corals (spiral in shape) and sponge spicules (tiny pointed fragments) are also to be found in some cherts. A few cherts, such as Galena, have faint fossil borings, left by the holes of ancient worms. Some cherts, such as Shakopee/Oneota from the Prairie du Chien formation, have oolites, which are small round grains formed by calcium carbonate.

Most fossil and non-fossil inclusions are visible with an unaided eye. A magnifying glass and x10 magnification microscope were used for a closer examination of potential inclusions and to search for the presence of some of the smaller varieties.

These six attributes were systematically recorded for the olive green cherts in order to determine the approximate source of the unknown greenish material. A data recording sheet produced for the study allowed room for notes and comments, and a sketch of the artifact (Appendix A). Photographs were taken using digital and regular cameras.

RESULTS

The eight artifacts in MVAC's collection as well as two on loan from private collectors were examined first. Described earlier, this assemblage consisted of three end scrapers, two drills, two flake knife/scrapers, one graver, and complete and incomplete Agate Basin Points. The collected data reveals extremely uniform patterns. Most were free of inclusions (two having limestone inclusions.) With one high quality exception, translucency was low, being 0.5 mm or less. These artifacts showed a characteristic color pattern and color. Below a reddish cortex ranging from Munsell colors of 10YR 6/3 to 7/4 and 5YR 6/3, typically lay a dark green layer of 6/5G to 7/5GY, both encasing a light green interior of 7/5GY to 8/5GY. This resulted in concentric or horizontal banding in some pieces, though distinctive banding was evident on others. Luster was consistently medium to medium fine, and a satiny texture proved common.

The data produced in this macroscopic examination compared favorably with the observations made by Morrow and Behm for Silurian II Chert (Behm and Morrow 1996). In order to further test the hypothesis that the olive green artifact from western Wisconsin represent Silurian II chert from the Door Peninsula, additional analysis was conducted on a sample of artifacts from archaeological sites on the Door Peninsula.

The University of Wisconsin Milwaukee (UW-M) and the Great Lakes Archaeological Center (GLARC) have undertaken salvage archaeology investigates along State Highway 57 on the Door Peninsula in recent years. Excavated sites peoduced workshop debitage, the physical debris created in stone tool production. A preliminary reconnaissance to UW-M in October of 2001 observed lithic assemblages from recent State Highway 57 excavations, which contained high frequencies of greenish chert material. In January of 2001, the author visited UW-M to study a sample of these artifacts. Given a limited amount of time for study a sample was taken from a particularly representative provenience, the 3rd level of Unit 3 from the Heyrman I Site (47Dr243). A random sample of thirty-six flakes was taken from the two hundred and six in the provenience. Chunk and shatter debitage was excluded from the sample. Six particularly characteristic artifacts, from the Beaudwin Village Site (47Dr432) and site 47Dr387, were also examined.

James Clark of GLARC, who has also been working in the same area of the Door Peninsula, was also consulted. At GLARC a number of green chert artifacts were observed. Clark provided a comparative sample of greenish chert collected from the Door Pennisula that appeared to be in the same geological family as the material under study. He also placed a few artifacts on loan for study. Two of these, flakes from 47Dr107, were analyzed.

The artifacts on loan from GLARC, and those studied at UW-M are very similar to those observed at MVAC. Translucency averaged 0.6 mm with some higher quality outliers, and luster was generally dull to satiny. Texture was medium to medium fine, and inclusions were generally absent. These results are comparable to those obtained from the Western Wisconsin artifacts. The coloring and color pattern of the UW-M and GLARC samples were also very similar to MVAC's artifacts. A reddish cortex with Munsell colors 10YR 6/4, 6/6, and 7/6, 7.5YR 7/6 and 6/6, to 5YR 6/4 with a thin green layer of 5/GY to 7/5GY underneath it, over a light bluish or greenish gray interior of 7/10PB to 8/10PB, and 7/5GY to 8/5GY. Some pieces showed touches of deep red, possibly as a result of heat treatment.

The observed Western Wisconsin artifacts and Door County flakes also closely matched the characteristics of Silurian II Chert, as defined by Behm and Morrow (1996). The textures being medium and medium fine and the luster dull to satiny, which matched the description for Silurian II. Transparency seemed greater in some higher quality pieces, but the average of 0.6 mm is very close to the 0.5 mm Behm and Morrow give for Silurian II. A lack of inclusions, greenish and bluish colors, and presence of horizontal and concentric banding all fit the description for Silurian II. Also, the burgundy and pink flakes studied at UW-M were consistent with the effects of heating according to Behm and Morrow (1996). Given the similarity of the materials observed in Milwaukee and at MVAC, the hypothesis that the olive green Paleo-Indian artifacts from western Wisconsin are manufactured from chert that originates in eastern Wisconsin's Door County is supported.

DISCUSSION

Mobile groups of people are generally unwilling to transport large amounts of heavy raw material great distances. Lithic raw material, often in performs (unfinished stone tools), was regularly transported great distances from its source in Paleo-Indian times. Good sources of lithic raw material were often part of the annual round of mobile people groups in pre-contact North America. The quantity of debitage, and presence of early stage cores and primary flakes of green chert at the Door County workshops suggests a source for the material in that area. Further, bedrock and beach cobble occurrences of green chert on the west side of the Door Peninsula are known and suggested to be Silurian Type II. Thus, the geological source of the green chert is comfortably affiliated with the Silurian formation on the Door Peninsula of Eastern Wisconsin.

CONCLUSIONS

Currently, only Paleo-Indian artifacts have been identified in Western Wisconsin made of Silurian II chert. The absence of flakes and debitage in the non-source area suggest completed tools were brought in for use. Use of Silurian II in Western Wisconsin is best represented by this study in the Paleo-Indian tradition. A flake knife/scraper at the Gail Stone site suggests Early Paleo-Indian import, while the two Agate Basin points made of the green chert confirm transport to Western Wisconsin during the Late Paleo-Indian stage. Given the more fluid and far reaching transportation networks of this period, more of the material seems to have found its way into Western Wisconsin than later.

A study of other Paleo-Indian lithic assemblages in Wisconsin would probably show further examples of this material. Examination of these collections could yield additional information on the use and mechanisms for movement of this material.

Further research is required to determine the extent to which Silurian II was utilized outside the Door County area. Though greenish or bluish gray are the most distinctive and easily recognizable shades of Silurian II, Behm and Morrow also describe hues ranging from gray to brown. Without their distinctive coloring, artifacts made of Silurian II are far more nondescript, though they can still be identified by the suite of characteristics that define it beyond color. A distribution study for Silurian II across the state of Wisconsin is needed.

The exact geological origin of Silurian II also remains a mystery. While acknowledging that the specific source of Silurian II remains in doubt, Behm and Morrow describe it as a chert of the Silurian formation which dates to 405-45 million years ago Behm and Morrow (1996). This formation is part of Niagara escarpment that dominates the Door Peninsula. However, James Clark (Personal Communication, 2002) suggests that the material is actually part of the Maquoketa Shale formation, generally described as Upper Ordovician, dating to 425-30 million years ago. Ordovician deposits lie below those of the Silurian. Research is needed to confirm the exact geological origin of this material, and the sources from which it is obtained on the Door County Peninsula. Archaeometric testing might better demonstrate the connection between the Western Wisconsin artifacts and Silurian. However, some of these analyses are destructive. Efforts to conduct minimally damaging Laser Ablation tests at the University of Wisconsin-Madison Archeometry Lab in 2001 were thwarted by non-functioning lab equipment (Burton, Personal Communication, 2001).

One probable source for much of the material being utilized by native groups may have been beach cobbles on the western side of Door County. These cobbles would have washed out of Silurian or Maquoketa outcroppings along the Niagara escarpment, and examples in the MVAC comparative collection were found at such a beach in 1978 and 2001.

Hopefully, this paper will allow others to identify Silurian II in other assemblages. As with other material identifications, once identification is made other examples may be more readily recognized. Further research is also needed to clarify the extent of Silurian II use and its exact origin. This paper has demonstrated that this material found its way into Western Wisconsin during the Paleo-Indian tradition. A wide range of further research remains open, and will be crucial in achieving an understanding of the role of this material in the dynamics of economy and trade for Wisconsin's first people.

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APPENDIX A

Lithic Source Analysis Form

Artifact Number: _____ Date: _____ Recorder: _____

Collection: _____ Source: _____

Artifact Type: _____ Photographed (Y/N) _____

Color: (Munsells) _____ Translucency: _____ mm

Inclusions:
- __ None
- __ Brachiopods
- __ Bryzoans
- __ Chrinoid Columnals
- __ Fusilinids
- __ Solitary Corals
- __ Sponge Spicules
- __ Fossil Borings
- __ Oolites
- __ Other: _____

Color Pattern:
- __ Solid
- __ Broad Mottling
- __ Marble Mottling
- __ Random Speckling
- __ Speckled Banding
- __ Streaking
- __ Horizontal Banding
- __ Concentric Banding
- __ Other: _____

Texture:
- __ Coarse
- __ Medium Coarse
- __ Medium
- __ Medium Fine
- __ Fine

Luster:
- __ Dull
- __ Satiny
- __ Waxy

Artifact Sketch_____

Notes: _____
_____
_____
_____
_____