Jonathan Migliori

18 July 2008

Mid-Point Lab Report

Introduction

In this UTRA, I am responsible for conducting research on lithic artifacts. These include stone tools, debitage (waste products from lithic manufacture), and gunflints. I aim to understand how the artifacts were made and how ultimately effective the manufacture techniques were. If possible, I would also like to source the materials.

Materials

My 14 samples came from two different sources. Nine came from Greene Farm, a farm in Warwick, Rhode Island. European settlers first inhabited the site in the mid-17th century, when it was purchased from the local Narragansett Indians. The artifacts come from the area of the old house. Artifacts 4083, 4111, 13428, and 13483 are catalogued as European flint; 4111 is a flake and the other three are debitage. 4119 is a quartz flake. 6952 is a gunflint. The other three artifacts are of Native American origin: 6869 is a flint projectile point, 10513 is a flint projectile point perform, and 11302 is a projectile point made of another type of stone. The other five samples come from the Joukowsky Institute for Archaeology and the Ancient World vaults. They are worked pieces of chert from Agrigento, Sicily.

These artifacts and their manufacture could tell us many things about who made them. The European flint was probably brought over as ballast from trade ships, and sourcing the flint could tell us whom the colonists were trading with. Examining the

typology and material of the projectile points could reveal commercial relationships between different Native American tribes in the region. The artifacts from Sicily will provide a basis of comparison for the Greene Farm artifacts.

Data & Methods

(All measurements given as length x width x height at the artifacts' widest points. See artifact sketches on wiki for orientation information)

Artifact 4083 is an "L"-shaped piece of flint from Greene Farm, cataloged as "European flint debitage." It is dark brown in color with bits of the grey cortex on the north face. It is 19mm x 15.9mm x 9.7mm. The bottom side shows evidence of fracture. Sample JM-1 (9.9mm x 7.9mm x 1.7mm) and was cut from the southeastern end of the top of 4083, and JM-3 (18.4mm x 14.3mm x 5.5mm) comes from the top. The tops of JM-1 and JM-3 show evidence of fracture. JM-2 (12mm x 3.6mm x 1.9mm) flew off 4083 when the other samples were being cut from it and was kept.

Artifact 4111 is from Greene Farm and is cataloged as "European flint flake." It is light grey in color. It is 19.7mm x 10.3mm x 2.6mm. The top side is clearly worked. Sample JM-9 (11.9mm x 2.8mm x 2.6mm) was cut from the southern face of 4111. The bottom side of JM-9 is worked.

Artifact 4119 is from Greene Farm and is cataloged as "quartz flake." It is mostly white with grey and brown spots. It is 18mm x 19.2mm x 2.6mm. Sample JM-5 (18.5mm x 15.9mm x 2.7mm) was cut from the top face of 4119.

Artifact 6952 is from Greene Farm and is cataloged as "gunflint." It is dark grey with specks of brown and light grey. It is 32.6mm x 24.9mm x 8.5mm.

Artifact 13428 is from Greene Farm and is cataloged as “European flint debitage.” It is light grey in color bits. It was broken into two pieces during sample cutting; the largest is 18.3mm x 8.1mm x 5.6mm. The top side is clearly worked. Sample JM-9 (11.9mm x 2.8mm x 2.6mm) was cut from the southern face of 4111. The bottom side of JM-9 is worked.

Artifact 13483 is from Greene Farm and is cataloged as “flint.” It is light grey with mottled darker grays. It measures 13.4mm x 8.9mm x 3.8 mm. Sample JM-6 (16.2 mm x 9.3mm x 1.8mm) was cut from the southern face. Its top side shows fracture marks.

Artifact 6869 (Sample JM-10) is from Greene Farm and is cataloged as a flint projectile point. It is a dark orange-brown. It measures 15.5mm x 32.3mm x 3.3mm. It is a Bare Island type.

Artifact 11302 (sample JM-11) is from Greene Farm and is cataloged as a stone projectile point. It is almost black with light brown spots. It measures 27.44mm x 18.2mm x 6mm. It is a Squibnocket type.

Artifact 10513 (Sample JM-12) is from Greene Farm and is cataloged as a flint preform. It is light grey with some dark grey spots. It measures 24.5mm x 18.9mm x 7.6mm.

Artifact JIAAW #1577 is from Agrigento, Sicily. It is white. It measures 31.1mm x 28.5mm x 8.7mm. There are deep fracture grooves on the top side.

Artifact JIAAW #1589 is from Agrigento, Sicily. It is tan. It measures 33.2mm x 19.8mm x 7.8mm

Artifact JIAAW #1605 is from Agrigento, Sicily. It is purple. It measures 43.2mm x 23.6mm x 10.7mm.

Artifact JIAAW #1608 is from Agrigento, Sicily. It is labeled as "tan-grey-brown." It measures 27.1mm x 19.9mm x 6.5mm. There are deep fracture grooves on the top side. Sample JM-8 (24.4mm x 3.5mm x 5.8mm) was cut from the south face.

Artifact JIAAW #1631 is from Agrigento, Sicily. It is red. It measures 23.8mm x 18.7mm x 6.0mm. Sample JM-7 (5.7mm x 14.1mm x 3.6mm) was cut from the west face.

Procedures

XRD

X-ray diffraction (XRD) was used to help determine the composition of the samples. My samples were all examined using an hour-long "Θ-2Θ" scan, which allowed them to be probed past the surface layer.

XRF

We used x-ray fluorescence (XRF) to determine the elemental composition of the samples. We carried out the procedure by placing the XRF "gun" over the samples on the table a letting it run two scans at a minute each. The procedure is limited, however, because it does not tell us about the compounds present in the samples, only their basic elemental make up, and the results are very prone to contamination from handling and the environment. It also does not pick up silicon, the main ingredient in chert and flint.

Optical Microscopy

I examined the various fracture surfaces of the samples under the optical microscopes in the Engineering laboratory. My images were constrained by the relatively

small area of the sample that the camera could take pictures of and the inability of the microscope to go below 50x magnification. Further pictures are on the wiki.

SEM

The scanning electron microscope (SEM) was used to get images of a higher magnification than the optical microscope would allow. Some samples were carbon coated and others were covered with copper tape for conductivity. The SEM is limited because the images it takes are black and white, and it is hard to properly focus at higher magnifications.

Data

XRD

There was a remarkable similarity in the XRD data between the samples. The peaks occurred in similar places, which the computer software indicated to mean quartz. This is expected because chert is described as "rocks composed of microcrystalline quartz" (Luedtke 5). The sample JM-11 had a very similar signature to the other artifacts, showing that it may be a silicate. The XRD, however, failed to reveal anything more substantial.

XRF (data on wiki)

The XRF revealed the trace elements in the samples. The XRF unit we used did not register any element lighter than phosphorus, including silicon and oxygen, the two main components of flint and chert. The only elements in quantities higher than could be

disregarded as “noise” were considered environmental contamination (Conversation with Brian Sheldon, 08/04/08). We could obtain more data in the future by employing a full-size XRF unit.

Optical Microscope (pictures on wiki)

The optical microscope pictures do not reveal as much as they could otherwise. The microscope’s lowest magnification was too high to capture enough of the fracture surfaces to extract much data. The additional zooming and cropping done by the camera, rendering an even smaller image, compounded this.

Scanning Electron Microscope (pictures on wiki)

The SEM images confounded our efforts just as much as the optical microscope. The difficulty in focusing increased with the magnification, which was especially unpleasant, because we needed the higher magnifications to see the grain size of the samples.

Results and Interpretations

After reviewing the data collected, I realized that none of it answered the original questions of how these tools were made and why the materials used was picked. Hopefully, the data will be of use to others pursuing materials-related topics with lithics.

Works Cited And Consulted

Hayden, Brian, ed. Lithic Use-Wear Analysis. New York: Academic Press, 1979.

Keeley, Lawrence H. Experimental Determination of Stone Tool Uses: A Microwear Analysis. Chicago: The University of Chicago Press, 1980.

Luedtke, Barbara. An Archaeologist's Guide to Chert and Flint. Los Angeles: Institute of Archaeology, University of California, Los Angeles, 1992.

Renfrew, Colin and Bahn, Paul. Archaeology: Theories, Methods, and Practice. 4th ed. New York: Thames & Hudson, 2004. 325–332.

Tucker, Maurice, ed. Techniques in Sedimentology. Oxford: Blackwell Scientific Publications, 1988.