

## Introduction

This project seeks to create a dynamic and comprehensive perspective on archaeological ceramics by marrying the contextual information gained by archaeologists through excavation, with that which can be revealed to us through analytical techniques and technologies used in the Materials Science field of Engineering.

Artifacts were collected throughout the course of the fifth season of the archaeological excavation known as the Greene Farm Archaeology Project (GFAP). The field season began on June 2, 2008 and ended on June 27, 2008.

The ceramics collected from Greene Farm are predominantly sherds of coarse red earthenware vessels not considered temporally diagnostic by archaeological standards. To add an additional dimension to the project, ceramic sherds from the “Old World” (primarily mainland Greece) have been donated by the Joukowsky Institute for Archaeology and the Ancient World (JIAAW) for the purpose of scientific comparison to the “New World” or Greene Farm sherds.<sup>1</sup>

## Greene Farm Excavation

Old House – Types of Materials

Observations during digging

Observations during screening

Clay samples

Midden

## Project Trajectory<sup>2</sup>

We will begin to treat the question of how ceramics were made by subjecting artifact samples to a range of firing temperatures. We hope to identify the temperature at which changes begin to occur to the structure of the sample.

Before commencing the series of high temperature treatments we will gain as much information as possible on the characteristic composition and structure of the specimen using the following techniques: X-ray Diffraction, X-ray Fluorescence, Optical Microscopy and Scanning Electron Microscopy.

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<sup>1</sup> Please see AG Artifact Catalogue(AG UTRA Catalogue.xls on wiki) for a full inventory of the artifacts under investigation.

<sup>2</sup> Personal communication, Sheldon, B. July 08, 2008

The extremely porous and friable nature of the ceramics being tested requires that we experiment with sample preparation methods particularly for use with the Scanning Electron Microscope. Specimen AG-8 also identified as artifact number 13695 from context GF1736 of the Greene Farm Archaeology Project will be used to test the most ideal method of sample preparation.

## Sample Preparation

Samples were cut from the ceramic sherds using a diamond saw. Water was used as a blade lubricant rather than the usual blade lubricant because the contents of the blade lubricant could not be fully accounted for.

During week 1 of the second half of the research project the team attempted both hot and cold mounts on samples of brick from the GFAP 2008. It was decided that hot mounting the samples would most likely compromise the integrity of the samples and potentially corrupt the results of optical examination. All samples were subsequently cold mounted.

While certainly a less detrimental mounting technique for the specimens under investigation, the cold mounting procedure did present some concerns. The possibility that the mounting epoxy would partially or completely impregnate the pores of the sample was one such concern. AG-8 Sample 1 after mounting was ground and polished, then carbon coated in preparation for SEM-EDS (scheduled for 07/22/2008).

## Materials Science Tests

### *ED-XRF*

In collaboration with the Center for Environmental Studies' Environmental Studies and Technical Manager Dr. David Murray ED-XRF analysis was conducted on July 10, 2008 and July 17, 2008 on the following samples:

AG-8	nonglaze
AG-8	glaze
Standardization	test
NIST 2702	soil standard
NIST 2781	soil standard
JIAAW#505	without holder, painted side
JIAAW#506	with holder, painted side
JIAAW#507	with holder, non-painted side
JIAAW#812	with holder, decorated side
JIAAW#813	with holder, not decorated
JIAAW#593	with holder, painted side
JIAAW#594	with holder, unpainted side
AG-11	with holder, outer side

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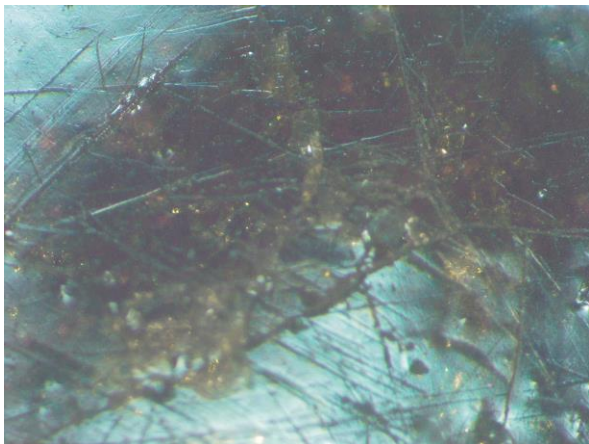
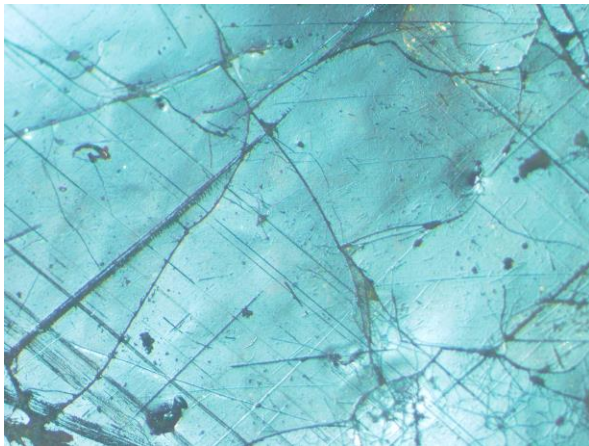
AG-11	with holder, inner side
AG-10b	with holder, outer side
AG-10b	with holder, inner side
Brick 1731	with holder, faced
Brick 1731	with holder, not faced (irregular surface)

Readings were taken for each specimen on the surfaces which contained some kind of decoration and the surface which did not.

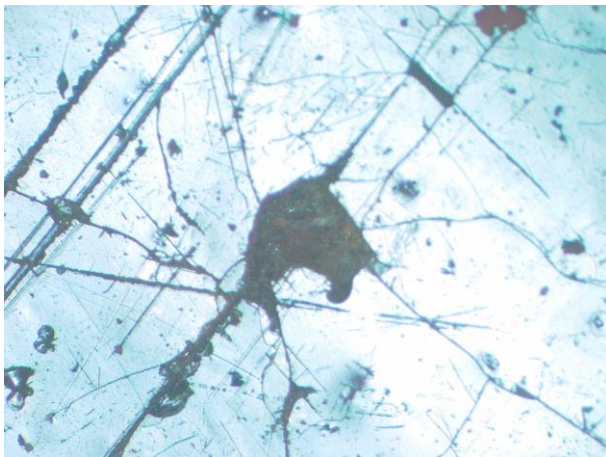
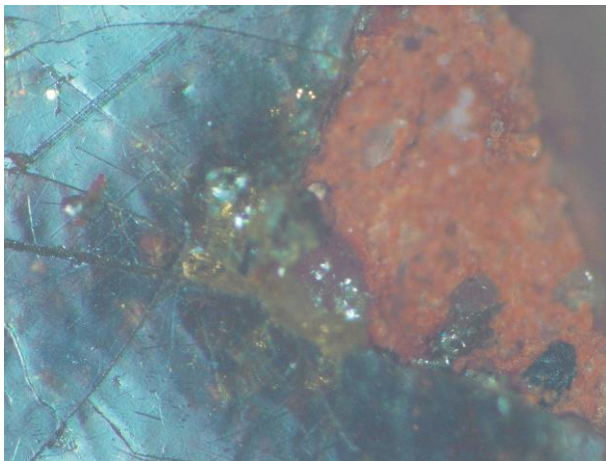
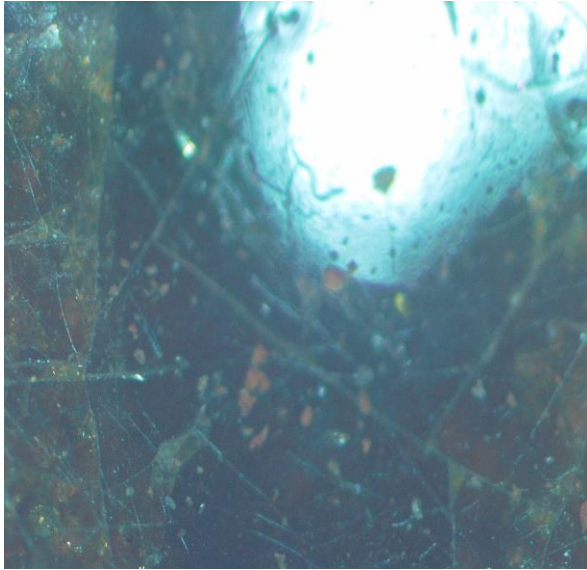
### ***XRD***

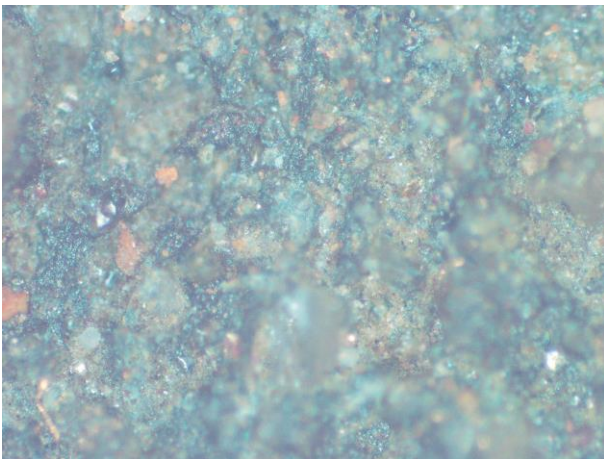
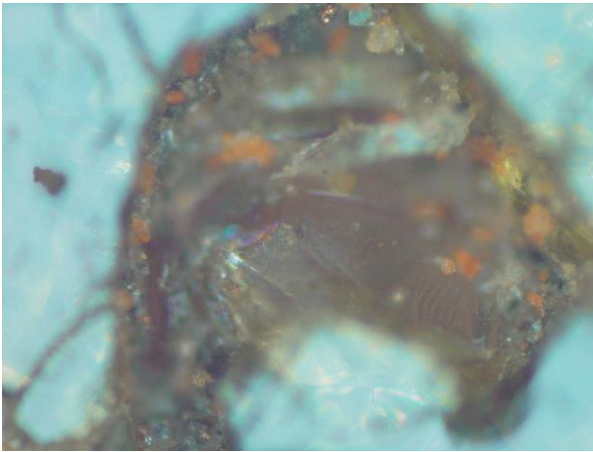
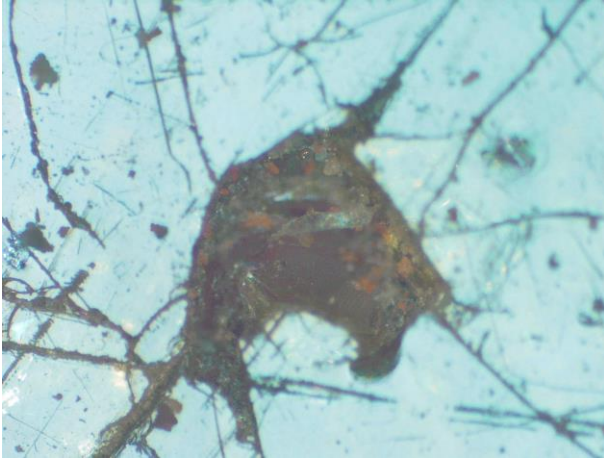
AG-8 has undergone a variety of x-ray diffraction scans, where the depth of the probe and test run-time have been altered.

### ***Optical Microscope***



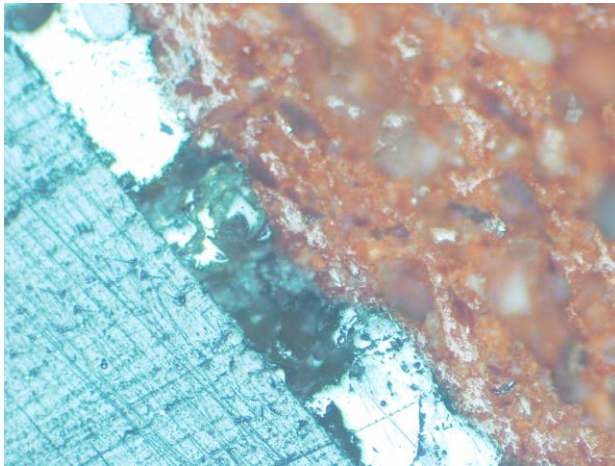
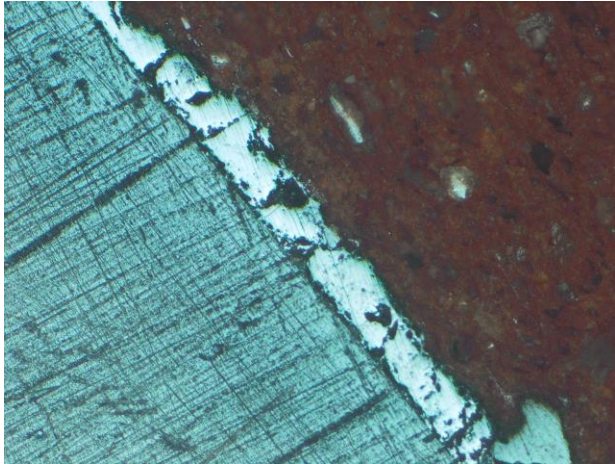
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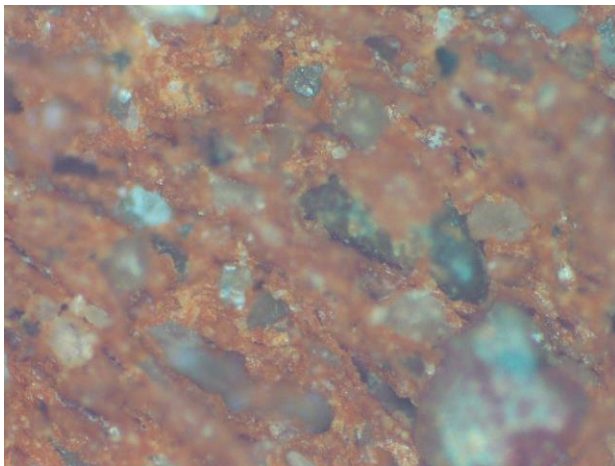
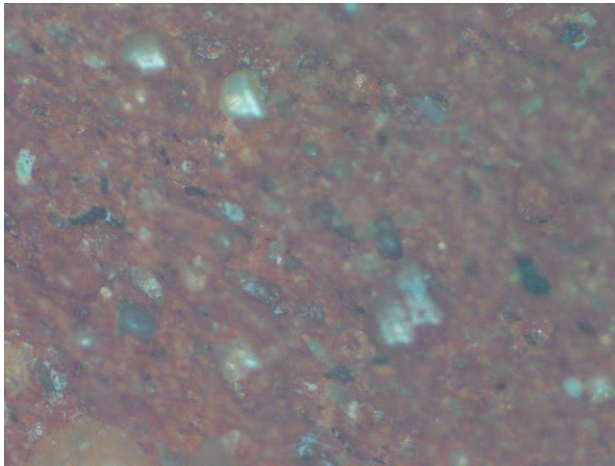






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## Current Analysis and Project

We are still unable to locate card files with which to interpret XRD data so not much can be said about the crystalline structure of the artifacts at this time.

ED-XRF standards are not well established for the types of the materials under investigation, and problems such as overlapping elemental signatures are of great concern. An interesting note however is that readings indicate a lead content in the glazed surface of AG-8 approximately 55 times that on the non-glazed surface of the same sherd.

Images from the optical microscope indicate the presence of many inclusions whose compositions are unknown at this time in the body of the ceramic. It is my hope that thin section and EDS analysis will give us a better idea about the nature of the clay fabric and its inclusion.