THE 2003 LEUPP KILN CONFERENCE REPORT
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The first annual Leupp Kiln Conference was held at Old Leupp, Arizona on Valentine's Day Weekend, February 15 – 16, 2003. The event was organized and hosted by Tim Wilcox of the Navajo Nation Archaeology Department, Northern Arizona University (NAU) and sponsored by the Institute of Archaeological Ceramic Research (IACR) of Boulder, Colorado. Tim, family and friends provided breakfast, lunch and dinner for all participants on Saturday, which was dedicated to pottery firing. A total of twelve registered participants attended the firing event. Participants with an asterisk preceding their names also participated in clay collection on Sunday:

* Charlie Gilbert – Phoenix, Arizona
J.K. Eardley – Emery, Utah
Marie Eardley – Emery, Utah
Jim Bob Eardley – Emery, Utah
Coco Vandenberg – Emery, Utah
Carissa Tsosie - NAU
Leah DeLaraett - NAU
* Bill Lucius - IACR
* Irene Lucius - IACR
Mike Yeatts – Hopi Tribe, NAU
Margo Nason - NAU
John (no last name available) – Flagstaff


Tim Wilcox and Irene Lucius

In addition, Kelly Hayes-Gilpin of NAU donated funds to offset the mineral collection permit fee and attended the firing with several guests. Thanks to all who attended and supported the event and especially those who brought pots to be fired.

Despite a deluge prior to the firing on Saturday, we persevered and dealt with damp fuel, wet sandstone slabs that exploded upon heating and plenty of mud. Two separate firing trenches were excavated into dry soil, a large one (Kiln1) for black-on-white firing and a small one (Kiln 2) for red ware replications and a demonstration of Navajo pottery firing.


Some of the 2003 Leupp Kiln Conference Attendees

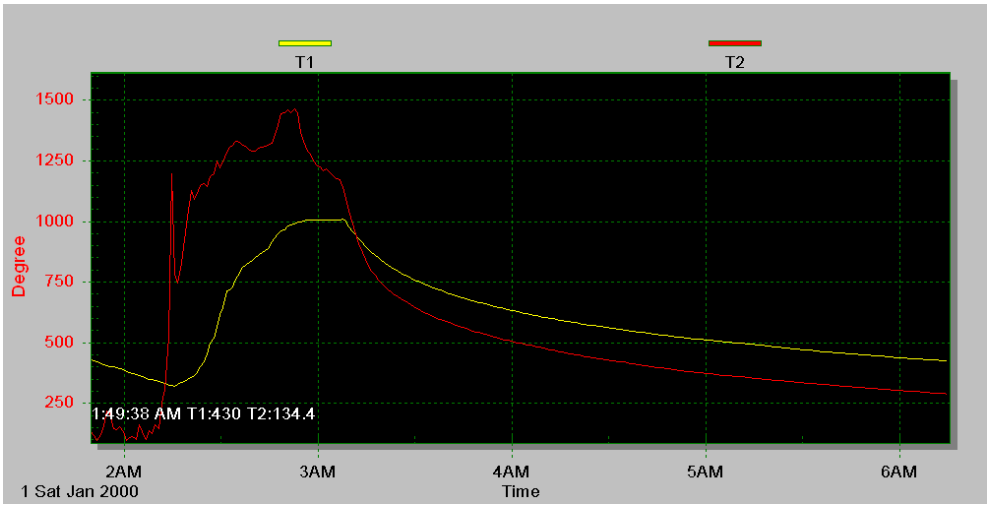
Kiln 1: Sandstone slabs were placed in the bottom of the larger trench and a preheating fire was set to dry out the slabs and prepare the pots for firing. No vertical slabs were used, which on reflection was probably a mistake – they would have provided support for the fuel and may have minimized oxidation along the edges of the trench. Since additional dry sandstone was not available, when the preheating fire had burned down to ash and coals the sandstone slabs were lifted slightly above the coals to serve as kiln furniture. The preheated pots were then placed on the slabs and carefully covered with cover sherds, prefired clay slabs donated by Charlie Gilbert and several pieces of tin.

Sandstone Slabs in Kiln 1

Preheating Fire in Kiln 1

Preheating Pots in Kiln 1

Three pyrometer leads were carefully positioned adjacent to the pots. Two pyrometer leads located in the admittedly cooler northeast corner of the trench recorded the firing progress. The central portion of the kiln was at least 100 degrees F hotter.



Time/Temperature Curve for Kiln 1 (Degrees F)

The fire was reignited and allowed to burn down, with fuel additions being made as necessary

Tim Wilcox and Mike Yeatts Setting the Fuel, Kiln 1

Ignition of Fuel, Kiln 1

to fill holes and to maintain a reducing atmosphere. Mike Yeatts and Tim Wilcox, being the most experienced replicators, decided to wait until the fuel had been consumed and reduced to ash and charcoal before covering the trench with the excavated soil, leaving a central vent to exhaust some of the heat and carbon. Eventually that vent was also covered with soil, and the kiln cooled until the soil was only warm to the touch.

Fire Burning Down, Kiln 1

Soil Covering, Kiln 1

Later that afternoon the soil was stripped off and the pots retrieved. Following are some observations about the firing:

Uncovering Pots, Kiln 1

✓ In general the firing was slightly oxidizing because of the high relative humidity and damp fuel, which served to slow down the rate of fuel combustion. Reduction was variable depending on where in the trench the pots were located and how well the cover sherds protected them. Not surprisingly, reduction was best in the center of the trench where the fuel and covering sherds provided the most protection from oxygen. Pots along the edges tended to be more oxidized. Future firings should avoid days or seasons with high humidity and/or rain.

✓ The firing did not achieve the targeted temperature, as indicated by somewhat fugitive iron paint on several vessels, which varied from red to black depending on the amount of oxidation. It is expected that better reduction and higher temperatures would have promoted sintering of mineral paints. Organic paints also tended to be washed out rather than a good black.

✓ Clay bodies were variable, so some gave a nice ring when struck while others were definitely under fired and somewhat soft.

✓ Gray ware pots were interspersed throughout the trench, but placing them toward the outside edges may have provided more protection for the painted pots. Since they do not have paint, the slight oxidation would not be as noticeable.

✓ There is a significant difference between molasses and bee weed organic paint. Tim had applied both paints on a single olla and the bee weed was significantly darker than the molasses on firing.

✓ Bill Lucius had several pots that had designs painted in bee weed several years ago as well as recently painted additions. The older designs came out very faded, while the newer designs were darker. This suggests loss of hydrocarbons from the paint over time.

✓ There was considerable spalling of some vessels and vigorous explosions of others (mostly ones made Bill Lucius). Although some of the problems might be attributable to placing the pots on moist soil during preheating, most of the vessels probably exploded due to unsuitable clay and temper combinations. The upshot is that not all clay bodies are amenable to the extreme heat shock of pit firing.

Kiln 2: No sandstone was used in the smaller trench. A preheating fire was set to dry out the trench and prepare red ware pots for firing. When the fuel had burned down to coals and ash, the pots were directly on the coals without any cover sherds. Juniper fuel was placed in a pyramidal fashion over the trench and ignited. No pyrometer readings were made. The fire was allowed to burn out without being covered with soil.

Ignition of Fuel, Kiln 2

Fuel Burned Down, Kiln 2

✓ Nearly every pot exploded or at minimum developed cracks, due again to improper clay bodies.
✓ The atmosphere was oxidizing, but relatively cool.
✓ Manganese paint suspended in bee weed was fugitive, it would wipe off. However, during a demonstration of Navajo pottery firing techniques in the same trench, one of the red ware mugs was refired using a combination of juniper and sheep dung, but this time well protected by cover sherds. When removed from the firing, the manganese had become black and quite permanent, although the refiring led to serious cracks in the clay body. Future red ware firings will attempt to determine if manganese paint permanence occurred because of the localized atmosphere created by the cover sherds, the higher temperature achieved by dung firing or some combination of these factors. It is unlikely that prehistoric potters fired pots more than once.

Clay Collection: On Sunday Tim and his cousin Dario led a crew on a collection trip that targeted clay samples from various locations under a Navajo Nation Mineral permit. This unprecedented opportunity to collect clays from Navaho Tribal lands was enjoyed by those who participated. Look forward to seeing some of those clays at the next Leupp Kiln Conference, which is tentatively scheduled for the Blanding, Utah area during June 2003. Bill and Irene Lucius have volunteered to host the event.

Formal voucher samples were collected from four distinct clay sources. Following standardized ceramic resource sampling procedures developed by the Institute, a geology ore bag was filled with clay and assigned a unique Clay Voucher Sample # that correlates with the UTM coordinates of each sample location (See table below). Approximately ¼ of each sample was mixed with water to a workable consistency then rolled out to create a test tile with a wet length of 10 centimeters. After air-drying the test tiles were fired in an oxidizing atmosphere to 950 degrees C. The associated shrinkage of each test tile is noted below, with the exception of

3CVS02, which exploded in the firing due to trapped water. A binocular microscope was used to inspect a broken corner of each test tile for identification of naturally occurring accessories. A Munsell Soil Color Chart was used to note the refired color of each clay sample.

✓ 3CVS02 clay is light colored and fires hard even under oxidation. Any potter would appreciate its plasticity and workability. It is expected that this clay source may have been selected for the production of Tusayan White Ware pottery types. The presence of ceramic artifacts in association with the clay source suggests that it may have been exploited as a prehistoric clay mine.

✓ The refired color of 3CVS04 exactly matches several refired Tusayan Polychrome sherds in the Institute collections. San Juan Red Ware was made exclusively with red-burning Morrison formation clays, and it appears that the prehistoric Kayenta red ware potters also targeted this formation.

✓ 3CVS01 and 3CVS03 display characteristic carbon cores indicative of substantial carbon content. The source of 3CVS03 is adjacent to a very large prehistoric site with pottery indicative of PI and PII occupation. The large amount of Black Mesa Black-on-white on the site suggests that this pottery type may have been made there using the adjacent clay source.

Sample	Northing	Easting	Locale	Facies	Refired Color	Accessories	Shrinkage
3CVS01	12S 0499893	3983526	Coal Mine Mesa	Mancos?	5YR7/4	Fossil Shell, Gypsum	11%
3CVS02	12S 0527188	4030966	Black Mesa	Mesa Verde?	10YR8/3	Gypsum	Unknown
3CVS03	12S 0524690	4030253	Black Mesa	Mesa Verde?	7.5YR8/3	None	9%
3CVS04	12S 0555834	4060364	Kayenta Valley	Morrison	2.5YR5/8	Shale, Quartz Sand	7%