Is It Hot Enough Yet? Reconstructing Firing Temperatures for Prehistoric Honduran Ceramics through Re-Firing Experiments

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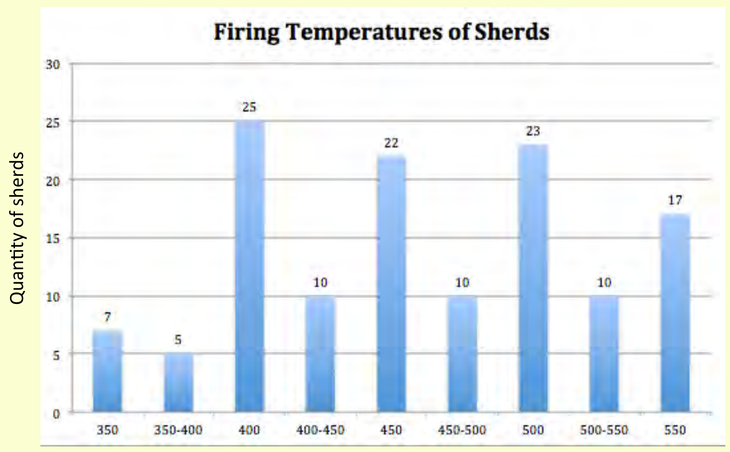
Abstract

Investigations conducted in the Naco Valley and its neighboring areas in northwestern Honduras conducted by Professors Schortman and Urban from 1975-2008 have revealed facilities in which ceramic containers were fired. The vast majority of these date to the Late (AD 600-800) and Terminal Classic (AD 800-1000) periods. Their diverse forms and dimensions suggest variations in aspects of production including the temperatures at which the vessels were heated and the degree of control artisans exercised over the manufacturing process. Over the span of the summer, I studied and conducted a re-firing of a sample of over 130 pottery sherds with the goal to identify an original firing temperature. The results of these tests are used to reconstruct the varied ways craftworkers who fabricated different classes of vessels in diverse facilities might have participated in the area's political economy and to infer how their roles in those relations changed over time.

Introduction

Pottery is one of the most common materials found on archaeological sites. It was the first synthetic material created by humans and has since had a long, complex history. Pottery is universal; it is found in all parts of the world among all kinds of people and has countless functions. Consequently, fragments of ceramic ware, or sherds, are discovered by the thousands in many sites and their study can provide insights into many aspects of past behaviors. Refiring sherds aims to discover the original temperatures of a firing, and from the temperature, to hypothesize the skills and techniques employed by ancient potters in firing their vessels. For this experiment, pottery sherd samples from Professors Schortman and Urban's work in the Naco Valley of northwestern Honduras were examined. The area encompasses 96 square kilometers of terrain split by the Chamelecon River. Over the course of their research, many questions arose concerning the basin's political economy. Craft production is a particularly useful topic for understanding how processes of political centralization were related to economic practices in prehistoric realms. The Naco valley was home to numerous artisans, especially from 600-1000CE. This study focuses specifically on the potters of La Sierra, the Naco Valley's regional capital during these four centuries. Knowing the maximum firing temperature of a ceramic vessel is crucial to archaeologists so that they can understand the technological processes employed by ancient potters. This maximum temperature is relevant in establishing the existence and sophistication of kiln technology in particular, and from kiln technology distinctions about social and spatial activities can be made. The knowledge of the firing context can lead to inferences about the skills potters had mastered, the volume of ceramic production, and the extent to which they engaged in their craft full-time or only during agricultural slack periods. The existence of craft specialization and mass production versus pottery made by the user in small quantities gives archaeologists information about the administrative strategies through which potters or their patrons might have controlled resources and people.



Temperatures in degrees Celsius

Methods

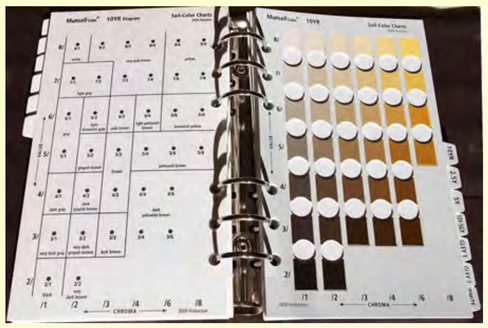
To carry out this experiment, I spent a lot of time completing preliminary research on the technologies employed in producing prehistoric pottery. I gathered from articles, books, and individual lessons with Professors Schortman and Urban a general understanding of the Naco Valley modes of production and political economy, especially the roles of craft manufacture in political processes. Additionally, because pottery investigations can be subjective, I learned and practiced the type-variety method for classifying ceramic fragments. The resulting pottery type is a distinct, recognizable unit that describes the paste and ware of ceramics. Clustered within types are sub-categories, or varieties that more specifically identify a group of ceramic ware according to decoration and finish. For this project I tested 34 types from within the site of La Sierra in the Naco Valley, which was the largest and most powerful center in the basin during the Late and Terminal Classic eras from 600-1000 C.E. From the different samples of types and varieties brought back for analysis and documentation from Honduras, I selected 136 sherds to refire in the electric kiln, a Paragon's Home Artist Digital Kiln. The widths of each sherd were taken initially. Weight was measured before and after each firing to monitor water loss. Before and after each firing, I assigned each sherd a color rating according to the Munsell Color Chart. This measures the hue, value, and chroma of each sherd. The original firing temperature of a vessel from which a sherd was broken is determined by noting a color change according to the Munsell chart. When a sherd's rating changes after a firing, the temperature at which it was fired was close to the original temperature. The color of a sherd changes once the original firing temperature is surpassed. For example, a sherd would be color rated at each firing. From temperatures 350°-500° Celsius if the color of that sherd did not change, then we could infer that the original firing temperature had not been reached. After the firing at 550° Celsius, if there was a change in the value, chroma, and/or hue then we could infer that the original firing temperature was close to 550°. This method was followed throughout the experiment, until every sherd experienced a color change. To simulate the process of firing and oxidation, the anthropology department provided an electric kiln with precise temperature and heating controls.

Results

After firing each sherd at 50° Celsius intervals between 350° and 550° Celsius, color changes were observed. Many correlations and inferences can be made concerning the type of sherd with the estimated firing temperature. Overall the results suggest that the majority of sherds were fired above 450° Celsius (see Graph A), suggesting that firing structures, such as kilns, were likely utilized to make most vessels used at La Sierra from 600-1000CE. The imported types, Tipon, Petoa, Cerro Azul, Ulua, and Peten, proved to have higher firing temperatures, between 450° and 550° Celsius, than did the locally made types. Many types exhibited a lot of variation in firing temperature, showing color change at all intervals between 350° and 550°. These types include Manacal, Jicaro, La Champa, Conejo, and Chamelecon, all of which have very different qualities. Similarly, the different households that were sampled within La Sierra showed variation of firing temperature. The household represented by excavations at Op. 11 proved to have sherds fired at each temperature. Calculated weight loss averaged to 4.71%, with the lowest being a Conejo sherd that lost 0.99% and was determined to have been fired at 400°. The highest percent weight loss was 11.56% of an El Chaparral Mottled sherd fired between 500° and 550° Celsius.

Conclusion and Discussion

This project yielded data that were ambiguous to some extent. The data yielded variation, which could be due to archaeological and historical factors. The variation in firing temperatures noted in the sample implies that these vessels were likely fired under a variety of conditions. Nevertheless, we can discern that the inhabitants of the Naco Valley during 600-1000CE were using kiln technology, several of those firing facilities having been found during excavations. The beehive kiln structures uncovered at La Sierra fit in this context, as La Sierra was home to artisans and workshops devoted to multiple crafts some of which may have been controlled by local leaders. That most vessels were fired between 350° to 450°, suggests that production of pottery was probably a specialized task engaged in by those who knew how to achieve and sustain these fairly high temperatures on a regular basis. Schortman and Urban have found in their excavations areas that have heavy concentrations of ceramic production debris including tools and features, such as kilns. The data agree with prior interpretations that La Sierra was a center for sophisticated craft production including the manufacture of ceramic containers at high temperatures under closely controlled conditions. It may be that some of these crafts were conducted under elite control, their products used by rulers to attract and hold clients. Others may have been employed by commoners to produce goods they exchanged on their own to enhance their material statuses. The evidence from this study suggests that artisans fashioning ceramic containers were able to tightly control the quality of their products while producing large numbers of vessels. Additional work using other lines of evidence will hopefully reveal whether those products were under the control of their manufacturers or served the political goals of leaders. I plan to continue my research on Naco Valley ceramics with a senior honors project investigating the firing temperatures of sherds from other locations and time periods, enlarging the sample to test the trends revealed in this initial analysis.



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References

Rice, Prudence M. *Pottery Analysis: A Sourcebook*. Chicago: U of Chicago, 1987. Print.
Schortman, Edward M., and Patricia A. Urban. "Modeling the Roles of Craft Production in Ancient Political Economies." *Journal of Archaeological Research* 12.2 (2004): 185-226. Web.
Schortman, Edward M., Patricia A. Urban, and Marne Ausec. "Politics with Style: Identity Formation in Prehispanic Southeastern Mesoamerica."*American Anthropologist* 103.2 (2001): 312-30. Web.
Shepard, Anna O. *Ceramics for the Archaeologist*. Washington: Carnegie Institution, 1971. Print.
Urban, Patricia A., and Edward M. Schortman. *Archaeological Theory in Practice*. Walnut Creek, CA: Left Coast, 2012. Print.
Willey, Gordon E., and Robert Wauchope. *Archaeology of Southern Mesoamerica: Part 1*. Austin: U of Texas, 1965. Print.