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Is It Hot Enough Yet?

Reconstructing Firing Temperatures for Prehistoric Honduran Ceramics Through Re-Firing Experiments

Caroline Del Giudice, Kenyon College

Investigations conducted in the Naco Valley and its neighboring areas in northwestern Honduras conducted 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. This experiment studies the refiring of a sample of 206 pottery sherds with the goal of identifying their original firing temperatures. 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 of production changed over time.. We aim to test the idea that, from AD 600-1000, complex firing structures were built and utilized in the Naco Valley, their usage spreading as the power of elites decentralized. We hypothesized that these firing structures were built in order to obtain high firing temperatures to produce high quality pottery as well as to increase scales and volumes of production.

Methods

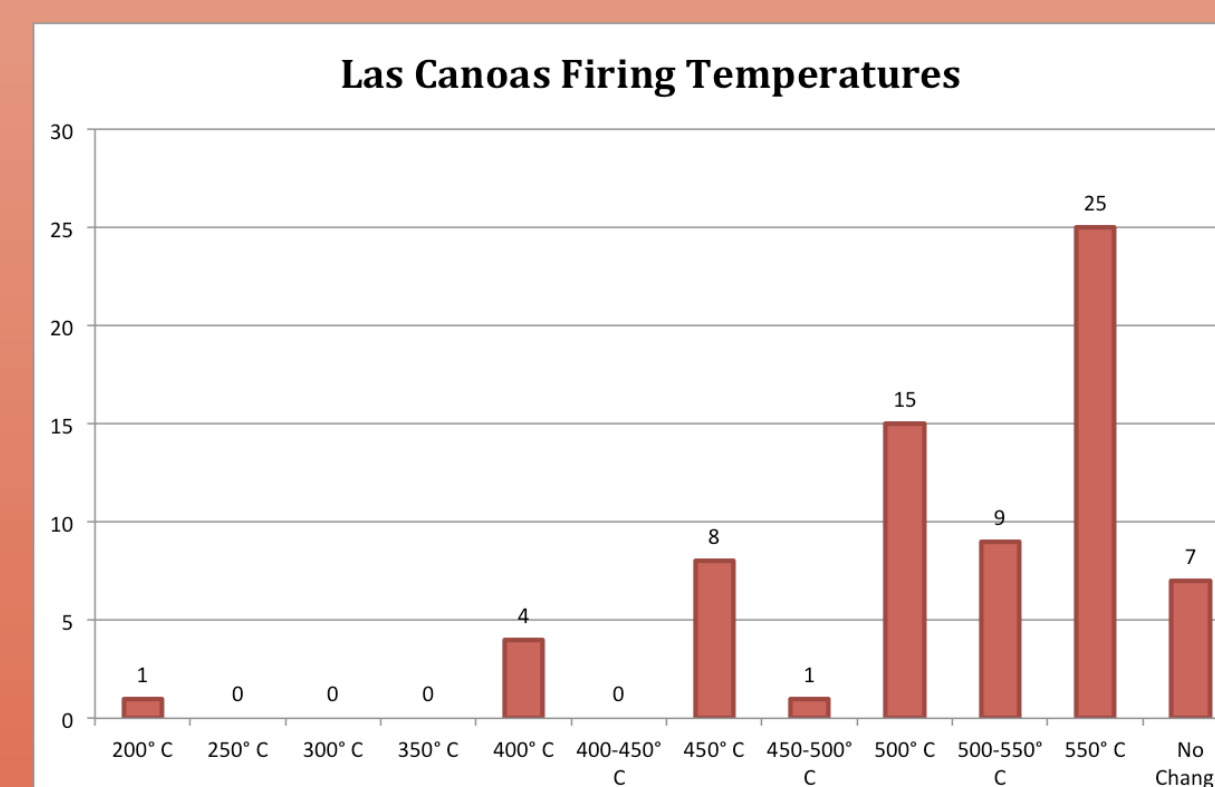
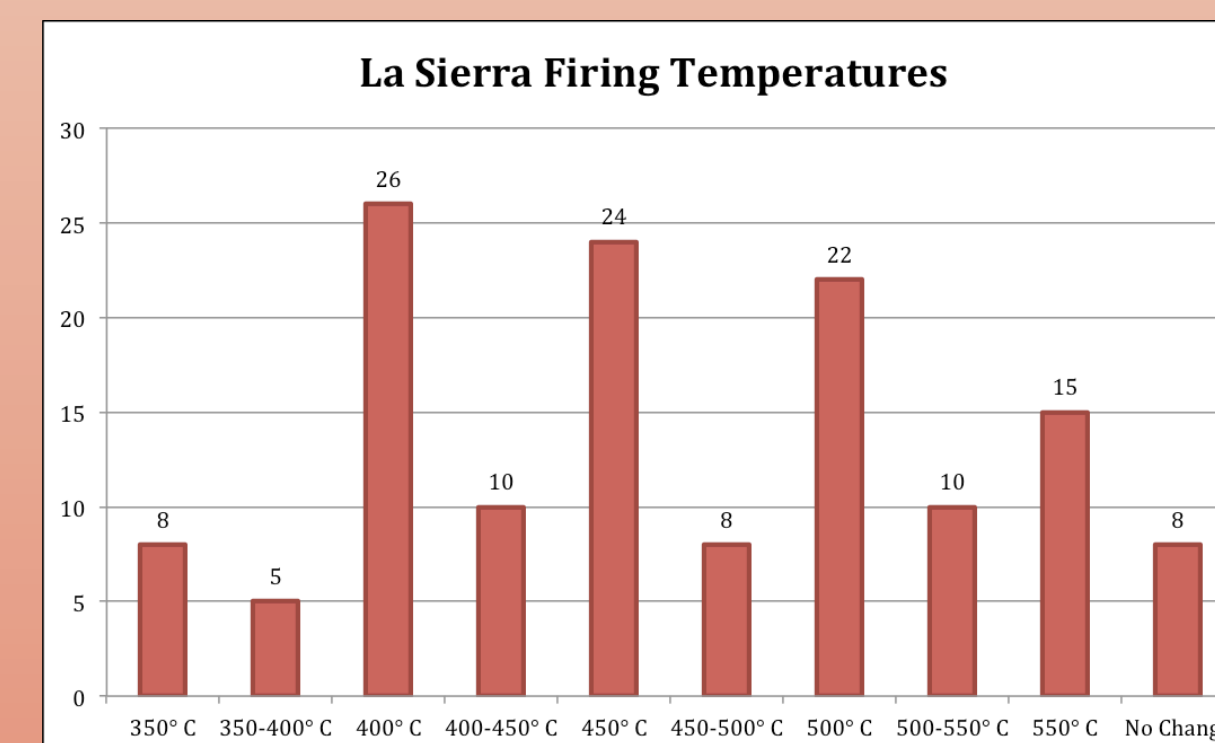
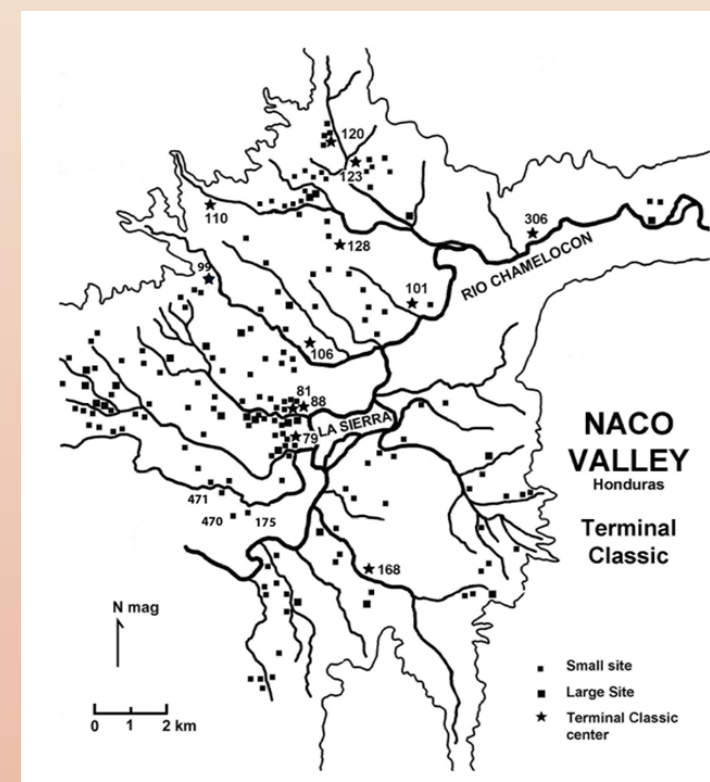
The controlled refiring of pottery in an electric kiln can establish the approximate original firing temperature. This project was executed on the premise that the surface and paste colors of a sherd will change when it is refired and exposed to a temperature higher than the one at which it was originally fired. If, for example, there is no color change noted in a sherd according to a Munsell Color Chart reading after refiring at 450°C or less but a noticeable change after firing at 500°C, then the sherd was likely originally fired around 500°. Changes in value, or grayness, of the color during the refiring process can speak to the atmosphere of the original firing as well as the levels of oxidization.

To produce a representative sample, 206 sherd from the sites of La Sierra and Las Canoas were selected to be refired. Both of these settlements yielded evidence of firing facilities dating to the Late and Terminal Classic. Each sherd was numbered, weighed, its width measured, and assigned a color value. Abnormalities of core color, smoke damage, or color shifting were noted. Using the Munsell Color Charts, the surface paste color and the interior core colors of each sherd were determined under natural, non-direct sunlight.

The refiring experiments were conducted outdoors with a Home Artist Digital Kiln with a Sentry Xpress Digital Temperature Controller. The first group of sherds that was refired consisted of a variety of types from locations scattered over La Sierra. Initial experimentation with the kiln established the range of temperatures to test. At increasing intervals of 50° C, sherds were fired at 350° C to 550° C. The kiln was set to heat as rapidly as possible, 1798° C per hour, and to maintain the peak temperature for 10 minutes before cooling. Sherds were removed after they reached a cooler temperature to be weighed and their colors documented. The second round of refiring focused on sherds from operations in Las Canoas. Based on the color changes observed in the previous firings, these sherds were fired at a lower starting temperature, 200° C, at 50° C intervals. An identical process of weighing and color assessment was followed.

Results

The refiring experiments of the 206 sherds yielded surprising data. Despite the evidence of firing structures or kilns at La Sierra and Las Canoas, firing temperatures of sherds from both sites proved to be relatively low. Overall the original temperatures of La Sierra sherds varied between 350 and 550° C, the median temperature was 450° C. The bulk of the sherds, about 66%, showed color change between 400 and 500° C. Weight loss varied within types as well as within the entire sample. A total of 70 sherds from Las Canoas was refired to establish their original firing temperatures. The median temperature of the original firing was slightly higher than at La Sierra, 500° C. Seventy percent of the Las Canoas sherds were refired at 500° C or higher. Only one sherd was found to be fired below 400° C.



Discussion

Overall, the data are not highly variable. The color changes observed in the sherds suggest that the vast majority of pottery from La Sierra and Las Canoas was fired at temperatures between 350 and 550° C. Across type-variety groups and sites, the estimated firing temperatures were almost exclusively in this range. This relative uniformity of firing temperatures suggests that Naco and middle Chamelecon valley potters in the Late and Terminal Classic periods exercised considerable control over at least the firing of their pottery. Despite the presence of enclosed firing facilities, however, the potters' goal does not seem to have been to achieve especially high firing temperatures. The outcome of this experiment is, therefore, surprising; why were people in the Naco and middle Chamelecon valleys using kilns if they were not achieving very high firing temperatures?

There are many possible explanations for the existence of kilns that fired at relatively low temperatures. The technological choices made by potters are socially constructed and learned, they have greater meaning than solely practical advantages. I argue that the kilns in La Sierra and Las Canoas were a physical construction of social identity and elite influence over pottery production, an expression of knowledge and technology in a period of growing class distinctions.

One explanation for the development of kiln technology that does not emphasize achieving high firing temperatures has to do with rates of fuel consumption. La Sierra and Las Canoas were constructed atop sizable clay deposits; the majority of the materials for producing pottery, except fuel, were easily accessible. With increasing populations fuel would have become ever scarcer. As kilns allow for an efficient use of fuel, their construction facilitated high volumes of production and success rates at relatively low fuel 'costs.'. More production of pottery enabled specialists to have more products to exchange, both for goods and symbolic preeminence.

The integration of ceramic production into the domestic spaces of Late and Terminal Classic households at La Sierra may have favored kiln construction. Despite the low firing temperatures, the physical presence of a kiln in one's domestic area emphasizes a household's specific roles in society, making salient the importance of elite-enforced social structures. We interpret the existence of kilns in domestic areas as visual expressions of the economic and social roles of potters rather than a technological innovation to elevate firing temperatures. Late Classic elites in La Sierra may have encouraged potters to be full-time specialists, offering them kiln technology to improve their scales and volumes of production and success in firing, in exchange for political support and control over production locations and the symbols that appeared on at least some vessels. The technological improvements associated with kilns, e.g., high success rates, facilitated this specialization. The kilns could point to the eventual monopolization of pottery production by artisans in the Terminal Classic who mastered the knowledge and techniques needed to make kilns and fire ceramics within them. It is likely that those with knowledge and access to pottery production protected their privileges by using kilns, further impacting class stratification.

Alternatively, commoners may have used their craft production from the Late Classic onward as a means of distinguishing themselves within the context of La Sierra and Las Canoas, a statement of autonomy and at least modest prominence. The ability to control the output of powerful symbols substantiates the importance of the potter's role in society. This is particularly possible in Las Canoas, where the firing structures are not attached to households and could have been more communal. Here it is conceivable that individual households may have fashioned pottery vessels for their own needs and for exchange.

With the improved production associated with kilns, semi-attached or independent potters could have controlled messages conveyed through symbols emblazoned on the vessels they made, thus exercising some power over those who used these containers.