Inka Craft and Ritual Production

Compositional Analysis of Pastes and Pigments from the Temple of the Sun, Pachacamac

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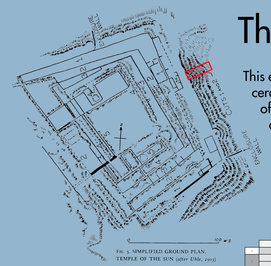
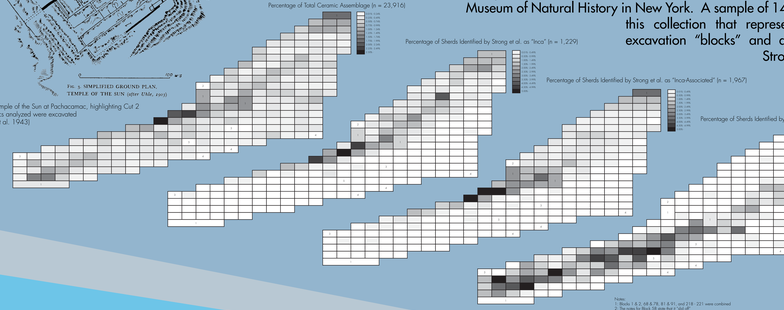
Pachacamac, an important oracle and ritual location on Peru's central coast since the Early Intermediate Period, experienced significant Inka investment. This is especially apparent when compared to other sites on the central coast (Shimada 1991; Marcone 2010). Because of the ritual importance of Pachacamac to local peoples, the Inka incorporated the oracle into their state cult instead of wholesale replacement (Bauer and Stanish 2001). A Temple of the Sun modeled after the Qorikancha in Cuzco was constructed at Pachacamac, increasing the site's ritual and pilgrimage importance across the Andes (Eeckhout 2013; Makowski 2014). The Temple of the Sun was the location of inclusive and exclusive rituals that were used to create and maintain control (Bauer and Stanish 2001; Hastorf 2007). These rituals required material culture, including pottery, for their authentic production (Bray 2003). This pottery was reproduced locally at state-sponsored workshops, creating symbolic vessels for ritual and everyday activities (Hayashida 1998, 1999). There is also evidence for pottery importation from other Inka centers (D'Altroy and Bishop 1990). Given Pachacamac's ritual importance, and given how ceramic production is organized by the Inka, how were rituals occuring at Pachacamac being provisioned? This research aims to address this question through compositional analysis of ceramic pastes and pigments from material in local and Inka styles.

The Sample

In 1941, William Duncan Strong, Gordon R. Willey, and John M. Corbett excavated a 24 meters long, 12.5 meters deep trench into a midden on the northeast side of the Temple of the Sun at Pachacamac. This excavation was not carried out using natural stratigraphic levels, but rather in "blocks," measuring 1 meter square and 1/2 meter deep. This excavation produced 23,916 ceramic artifacts. 4,049 of these were diagnostic. Strong and his colleagues divided these ceramics into three groups based on stylistic attributes: "Inca" sherds, a "well-known style generally based on consideration of ceramic materials from Cuzco or other highland sites presumably pure Inca in origin" (1943:50), "Inca-associated," "styles occurring with but not all culturally cognate with Inca" (1943:56), and "Early Pachacamac," composed of "Interlocking" and "Negative" styles. These "Early Pachacamac" styles are better described today as "Lima" and "Nieveria" (Ravines 2011; Shady 1982). These ceramic artifacts are now in the collections of the American Museum of Natural History in New York. A sample of 149 ceramics was selected from this collection that represents a diverse distribution of excavation "blocks" and all three "styles" as defined by Strong and his colleagues.



Map of the Temple of the Sun at Pachacamac, highlighting Cut 2 where ceramics analyzed were excavated (from Strong et al. 1943)

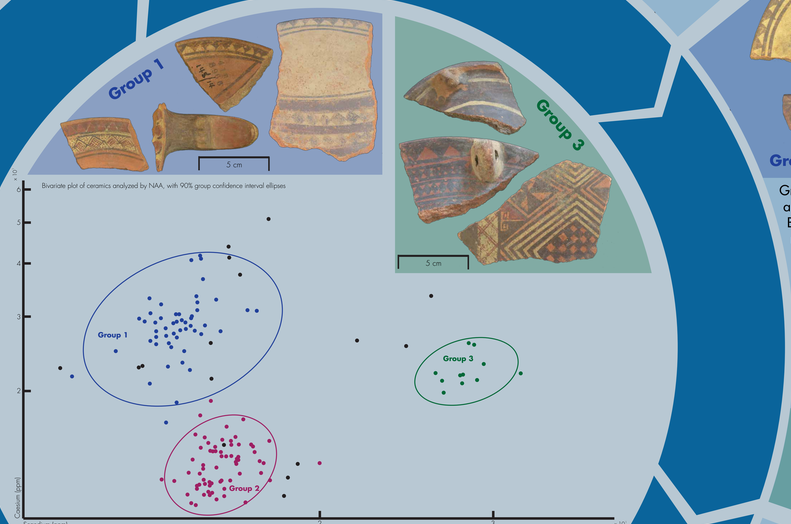


Schematic profiles of Cut 2 showing occurance percentages of different "styles" identified by Strong et al.

Paste Compositional Analysis

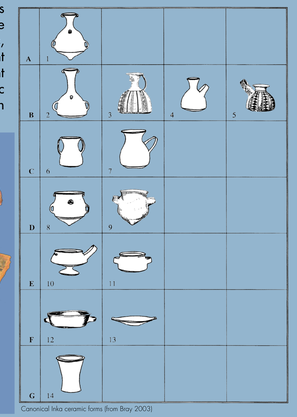
Neutron Activation Analysis (NAA) was performed on these ceramics at the Missouri University Research Reactor in Columbia, Missouri. Standard laboratory procedures for this analysis were followed (Glascock 1992). From each sample, all surfaces were removed and the sample was then homogenized. This homogenized sample was irradiated, and the specific counts for 33 elements were measured by a germanium detector. The data were calibrated using four standards: SRM1633a, SRM688, SRM278, and Ohio Red Clay.

These calibrated data were organized into groups, shown in the figure in the center of the poster, using multivariate statistical analysis. This was accomplished through calculating Euclidian distances and using principal components analysis. Mahalanobis distances were calculated to evaluate group membership. In the central graph, group membership is denoted by color: Group 1 is in blue, Group 2 in magenta, Group 3 is in green, and Outliers are black. Ellipses on the graph represent 90-percent confidence intervals for group membership.



Results

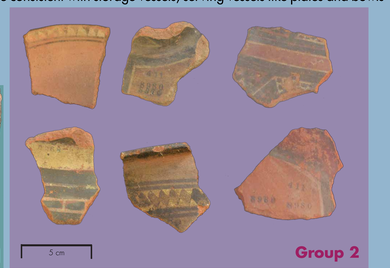
Group 1 is comprised exclusively of members that Strong and his colleagues categorized as "Inca." When form is able to be identified, these ceramics are plates, bowls, and storage vessels, corresponding to conventional forms present across the Inka empire, shown in the figure to the right (Bray 2003; Meyers 1975; Rowe 1944). Some ceramic sherds assigned to Group 1 are pictured in the blue field in the center and below.



Canonical Inka ceramic forms (from Bray 2003)

Group 2 is comprised of members of all three styles identified by Strong. This group contains all of the "Early Pachacamac" ceramics that were analyzed. It also has ceramics that are "Inca," similar to those in Group 1, "Inca-associated," which have characteristics Ychsma styles (Vallejo Berríos 2004) and of pottery that is sometimes called "hybrid," "regional," or "local" Inka. These terms are used with various meanings by researchers, but often refer to Inka material that is of lower quality in manufacture or decoration than that of highland origin, or material that blends forms or design elements from Inka canons with local traditions (Quave 2012:196). In this situation, both of these definitions of the term are present. Some ceramic sherds assigned to Group 2 are pictured in the magenta field in the center and below.

Group 3, like Group 1, is comprised of members that Strong and his colleagues categorized as "Inca." In contrast to Group 1, however, the forms present in Group 3 are more limited. The decorations and forms are consistent with storage vessels; serving vessels like plates and bowls are absent from this group. In particular, the flaring neck, nub attachments, and fern design motifs are all attributes found on aribalos (Bray 2000). Some ceramic sherds assigned to Group 3 are pictured in the green field in the center and below.

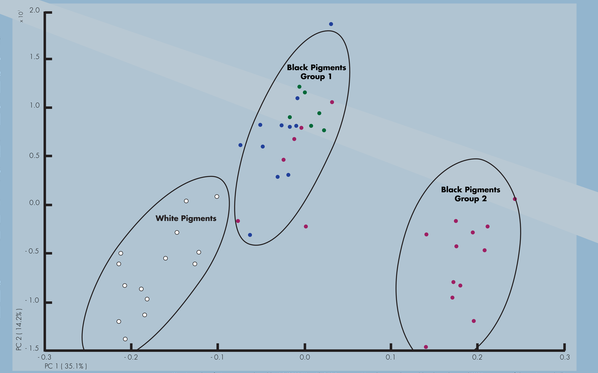


Pigment Compositional Analysis

A selection of this sample was additionally analyzed using Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS). A total of 59 pigment samples (both black and white) from 45 ceramics were compositionally analyzed. This subsample included members from all three identified compositional groups, and all three "styles" identified by Strong and his colleagues. Samples were mounted on slides of 16 samples and 4 standards (SRM 610, SRM 612, SRM 679, and Ohio Red Clay). On each sample, 7 separate runs of 40 μ in length were ablated, mixed with an Argon (Ar) carrier gas, and analyzed by a quadrupole mass spectrometer. The data were then calibrated using the "Gratuze method" (Gratuze et al. 2001) and expressed as oxides. These calibrated data were then organized into groups, shown in the figure in the lower right corner of the poster, using multivariate statistical analysis. This was accomplished through calculating Euclidian distances and using principal components analysis. Mahalanobis distances were calculated to evaluate group membership.

One group of white pigments was identified, while the black pigments were split into two groups. The first group, Group 1 (shown in the figure to the right with a 90 percent confidence interval ellipse) is comprised of varied membership: the ceramics are from all three identified Neutron Activation Analysis groups (signified by the dot color), however all of the ceramics are what Strong and his colleagues identified as "Inca." In contrast, Group 2 is comprised exclusively of ceramics they identified as "Early Pachacamac."

Example of LA-ICPMS sampling



Bivariate plot of pigments analyzed by LA-ICPMS, with NAA compositional group denoted by dot color, and 90% group confidence interval ellipses

Conclusions

The results of this analysis illuminate some ways that rituals were provisioned by the Inka at Pachacamac. The compositional similarity of sherds in Group 2, comprised of both local and imperial styles, supports the idea of local reproduction of Inka pottery, and that the extant raw material used in local pottery manufacture was sufficient for the reproduction of imperial forms and styles. The presence of two distinct groups (Groups 1 and 3) comprised exclusively of imperial style sherds, however, adds the possibility of either another local raw material source being accessed or the importation of some forms from other Inka centers. These forms—serving and storage vessels—are among the most common found in provincial imperial assemblages (Bray 2003). This research would benefit from further petrographic thin section analysis and a survey of local source material.

In the analysis of the pigment composition, the identification of two distinct compositional groups for black pigments supports the idea that local pigment recipes were not used in reproducing Inka style pottery. This difference could be a technological or symbolic necessity, and more research is necessary to determine other production differences. For Group 1 of black pigments, the presence of three different paste compositional groups and the absence of any material decorated in local styles may indicate a pigment recipe used broadly across multiple manufacture locations. The small sample size is too limited to draw any definite conclusions, and broadening of this research would be beneficial.

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