

It is often difficult or impossible to disentangle technology from culture, especially in the archaeological record when thousands of years of deposition, corrosion, looting, and other transforms stand between us and our understanding of past societies. However, often times, inferences can be made by considering artifacts and remains in the larger context of a bygone society or by drawing ethnographic analogies to current day practices. In particular, metallurgical processes are often defined by and define the people who partake in them. For instance, Gordon and Killick (1993) cite two examples of iron bloomery smelting: that in the Eastern Adirondacks in New York and that in Malawi, Africa. In both cases, social forces define the manner in which the smelting is conducted. Additionally, in "The Last Ironmaster," a man restores a tradition of iron ore bloom smelting that has not been seen in his village in several generations. Of note is that in addition to an impressive smelting technique, ritual practices are used to commune with the smelters' ancestors, bringing them good luck in the smelt. Despite these models, many authors do not evaluate the social factors that go into manufacturing metal artifacts, often leading to incomplete understandings of the archaeological context from which the artifacts come.

Burger (2004) provides a reconstruction of the life of non-elite "retainers" at Machu Picchu by examining grave goods, human remains, metal artifacts, and architectural features. With such evidence, the article convincingly makes conclusions on the subsistence, health, diverse culture, craft production, and general technical understanding of the retainers. Machu Picchu was a vacation retreat for Incan royalty, who occupied the site during the dry season. During this period, the retainers most likely focused their attention on the needs of the royal families and their guests. However, Burger goes on to say that during the rainy season, the non-elites were left at the mountain site to essentially do as they pleased. It was during this period that the non-elites produced metal objects. In particular, this 'idle

season' might have led to experimentation, as exemplified by an unprecedented high-bismuth ritual knife. While Burger refrains from explicitly stating it, the implication is that the social relationship between the retainers and the Incan royalty guides the seasonal production of metals at Macchu Picchu. Though the specifics and an expanded discussion of this relationship are excluded as they are out of the scope of the overview-type article, that there is an intermingling of social factors and metal production is evident. In the future, a follow-up article detailing the seasonal metal production could help to get inside the metallurgists heads, so to speak, so as to shed light on the relationship between the retainers and their royal counterparts.

Scott's 2001 scientific examination of an Italian Renaissance silver basin is an extensive characterization of about every possible physical aspect of the said basin. Scott utilizes scanning electron microscopy with an attached x-ray dispersive spectrometer (SEM-EDS), x-ray fluorescence (XRF), inductively coupled plasma mass spectroscopy (ICP-MS), and thermodynamic phase analysis to study the basin's composition, grain structure, phases, and Pb isotope ratios to reconstruct the piece's manufacture and subsequent repair. Despite his impressive characterization, Scott does not place his findings in a social context. In fact, he states himself that the scientific study of the basin "should ideally be set into a wider context based on the examination of several Renaissance silver objects of a comparable nature." In particular, Scott's further research could pose anthropological questions, relating the inferred production process to raw material acquisition, the status of the craftsman, the repair of the basin through time, and the use of the artifact.

In summary, while authors display a keen awareness of the inseparable nature of social influences and metal production in their articles, oftentimes, the social aspects are ignored. While maybe not to the same extent that Gordon and Killick discuss the social factors influencing bloomery smelting, Richard Burger at least hints at the social relationship between the Machu Picchu non-elites and elites being a factor in the seasonal production of metals. On the contrary, David Scott's examination of a silver

Renaissance basin essentially ignores social influences on the production process in favor of exploring every technical detail of the basin. While it is important that archaeologists consider social and cultural factors affecting production, there is a time and a place for everything. In some more technical journals, analysis of social factors is unnecessary and perhaps even unwelcome. Analogously, often times, technical details are unwanted in lieu of social and cultural forces at work in the production process. In the case of metal production, as with many archaeometrical studies, striking a healthy balance between scientific observations and the examination of social factors seems to be a promising option.

References:

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Gordon, Robert B. and David J. Killick 1993 Adaptation of Technology to Culture and Environment: Bloomery Iron Smelting in America and Africa. *Technology and Culture*, 34:243- 270.