Working With Expedient Lithic Technologies in the Northern Highlands of Peru

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ABSTRACT

Archaeologists frequently overlook the lithic technologies of complex societies, in part because these technologies are often very informal and expedient. Lithic assemblages from Andean complex societies show that informal chipped lithic tools were used extensively throughout the pre-Hispanic Andes, although few studies have focused on these artifacts. In this paper, I explore ways that we can derive social information from informal lithic tools and their waste cores and debitage. I do this by analyzing the chipped lithic artifacts excavated from four sites associated with the Oracle of Catequil, a major ceremonial center in the northern highlands of Peru that was in use from ca. 400-1555 C.E. This assemblage consists almost exclusively of informal lithic tools and these were produced in a very expedient manner. By studying both production and function, I show that important social and economic information can be discerned from studying informal and expedient chipped lithic assemblages.

Although common in many archaeological contexts, archaeologists often overlook artifacts from expedient lithic technologies, preferring instead to study curated and formal lithic tool types. Formal lithic tools, which are those that have been intentionally shaped by the knapper following pre-conceived functional or stylistic guidelines, have traditionally been used extensively in archaeological analyses to determine everything from cultural sequences to economic efficiency and patterns of curation (Close 1978; Flenniken 1994; Hayden et al. 1996; Odell 1996a). On the other hand, informal lithic tools are generally produced expediently and do not follow pre-determined design criteria, and because of their short use-life they are thought to convey less social information than their formal lithic counterparts (Gero 1989). This is problematic since expedient lithic forms, such as informal flake tools, are often thought to characterize the lithic technology of sedentary and complex societies (Jeske 1992; Nelson 1991; Parry and Kelly 1987). Still, the careful study of informal lithic tools...
technologies can lead to important, if sometimes modest, information regarding the social, economic, and technological conditions that surround lithic production and use (Gero 1989). However, this raises an important question: what lithic attributes and analytical techniques are useful for deriving this information from an informal lithic assemblage? Any answer to this question necessarily depends on the particular assemblage and on the specific concerns of the researcher. In this paper I describe some interesting conclusions derived from an analysis of the largely-informal chipped lithic assemblage excavated from four sites associated with the Oracle of Catequil, a sacred and important figure in the northern highlands of Peru, whose main shrine was in use from ca. 400 C.E. until 1555 C.E.

Lithic Analysis in Complex Societies

Archaeologists studying complex societies have traditionally overlooked chipped lithic tools, preferring instead to focus on other avenues of research such as ceramic fineware and monumental architecture. Lithic technology has also been overlooked because of a widespread misconception, particularly amongst Old World archaeologists, that metal tools quickly replaced lithic ones in complex societies (Odell 1996b: 125). Metal never attained widespread use as a utilitarian tool in the pre-contact New World leaving stone as the primary cutting implement (Lechtman 1984), but even in the Southern Levant, an area with a rich history of metallurgy, chipped lithic and metal technologies coexisted for over three millennia (Rosen 1996, 1997). In recent decades lithic analyses from complex societies have become relatively commonplace, but have largely focused on the eastern Mediterranean and Near East, the Mississippian bottomlands, and parts of Mesoamerica. Lithic studies remain uncommon from ceramic-bearing contexts in the Andean region.

Expedient lithic technologies, namely informal flake tools, are often thought to dominate the lithic assemblages of complex societies. It is generally argued that informal tools are a more efficient way to organize lithic technology in a sedentary society that satisfies most of its subsistence needs through agricultural practices and does not rely on hunting (Parry and Kelly 1987). This is because informal flake tools can generally perform all of the same tasks that formal tools can, but their production requires much less time and skill than formal tools—thereby increasing efficiency by freeing the knapper to work on other daily tasks—and their heavy raw material needs can be met by stockpiling materials at a permanent site (Jeske 1992; Nelson 1991; Parry and Kelly 1987). Formal tools, on the other hand, are considered to be efficient adaptations to hunting and gathering primarily because they are light, multi-functional, and highly portable (Close 1996). While Parry and Kelly’s (1987) model is quite
generalized and over-simplified, it does provide a useful framework for examining lithics in sedentary societies. For instance, although Parry and Kelly developed this model based on North American and Mesoamerican contexts, Gero (1983) used similar logic to explain the abundance of informal flake tools at the formative site of Huaricoto in the central highlands of Peru, and Rosen (1996) found that projectile points declined in quantity due to increasing sedentism well before the advent of metallurgy in the Negrev region of Israel. Still, the situation in complex societies is more complicated because there are also socioeconomic factors such as craft production and elite display that affect the lithic assemblages of these societies. Blade tools, for instance, are a common formalized tool type in many complex societies. Blades are very efficient but require high-quality raw materials and a high investment of skill (Crabtree 1968), and as such are considered more susceptible to elite control than are informal tools (Clark 1987, 2003). In the Negrev, Rosen (1997) synthesized the long-term trends of many different lithic tool types and showed that while lithic technology generally became more informal through time, many specialized formal lithic types, such as obsidian sickle blades, were actually more common in the Bronze and Iron Ages. This led Rosen to question the generalizing and deterministic nature of Parry and Kelly’s 1987 model (Rosen 1997:113-114). Thus we can expect that complex societies will employ a relatively greater amount of informal flake tools compared to formal lithic tool types, but we must be cautious not to attribute too much to this general trend.

Most lithic analyses in the Andean region have focused on mobile Paleo-Indian and Archaic hunting and gathering or fishing societies, where lithic assemblages were generally characterized by well-made and curated lithic forms, such as the large and intricate Paiján projectile point of the north coast of Peru (Chauchat et al. 2004; see also Moseley 2001). However, in a region where large sedentary sites predate intensive agriculture, where the first monumental architecture appeared in the Preclassic period, and where fancy ceramics, elaborate metal ornaments, and intricate textiles are only the tip of the archaeological iceberg, it is perhaps not surprising that archaeologists have generally overlooked lithic artifacts from Andean complex societies. The few lithic studies that have been conducted for Andean complex societies have largely focused on the highland areas of central Peru (Costin et al. 1989; Gero 1983, 1989; Read and Russell 1996; Russell 1988; Stone 1983) and on the Lake Titicaca basin of Bolivia, (Bandy 1995; Bencic 2000; Giesso 2003; Seddon 1994). Little work has been done in the northern highlands of Peru, where I conducted my analysis, or on the Pacific coastal regions. It is worth noting that obsidian was traded widely throughout the Andes and this trade has been fairly well-documented (Burger and Glascock 2000; Burger et al. 2000; Jennings and Glascock 2002), but these studies have largely focused on trade patterns and not
on obsidian lithic technology, although Burger (2007) has recently offered a preliminary analysis of some obsidian projectile points from Paracas on the south coast of Peru.

While limited in regional and chronological scope, the current literature shows that informal chipped lithic technologies dominated the lithic assemblages of all Andean complex societies. Sievert and Wise (2001; see also Wise 1999) have shown that the sedentary fishing community at the Kilometer 4 site primarily used informal lithic tools as early as the late Archaic period on the south coast of Peru, presumably because they were not hunting. Hunting was also unimportant to later Andean agriculturalists, and it is therefore not surprising that all analyses of Andean complex societies indicate that chipped lithic assemblages were dominated by informal and expedient flake tools. Formal blade technologies have been reported in the central highlands of Peru (Russell 1988; Stone 1983), but these were apparently uncommon or absent in most Andean assemblages. A few studies have examined how lithic technology changed through time in a certain region, particularly focusing on how the technology changed in response to changing sociopolitical conditions, but these have generally shown that lithic technology remained informal despite any greater societal changes that may have taken place (Costin et al. 1989; Gero 1983, 1989; Giesso 2003; Seddon 1994). These studies, as well as Vining’s (2005) study, have shown that sociopolitical changes did sometimes lead to variations in raw material use and in the quantities of different tool types, but the actual tool production and use remained fundamentally the same. Expedient, informal lithic technologies dominated the majority of these assemblages, and lithic technology was primarily an uncontrolled, non-specialized craft. The lithic assemblage from San José de Porcón shows a remarkably similar pattern, enabling insights regarding the organization of lithic technology at the four sites considered in this analysis.

**San José de Porcón**

The lithic assemblage that I analyzed was excavated from four integrated sites associated with the worship of Catequil, an important ancestor and oracle in the Huamachuco region of the northern Peruvian Andes. My analysis focuses on the sites of Namanchugo, Chulite, Chuquicanra, and Cerro Icchal. These four sites have been excavated over a number of field seasons by the ongoing Catequil Project, led by Dr. John Topic of Trent University. All four sites are located on and around the mountain of Cerro Icchal (Figure 1), which is considered to be Catequil himself, and this is located near the present-day village of San José de Porcón (I will hereafter use the term “Porcón” to refer to these four sites as a whole). Catequil drew worshippers on pilgrimage from surrounding regions, and would have drawn both elite and commoner worshippers; in fact, the Inca
Emperor Atahualpa visited Catequil and destroyed the shrine, shortly before his own demise at the hands of the Spanish in 1532 C.E. (Topic et al. 2002). Most pilgrims would have visited the shrine for important annual festivals, but it likely drew people primarily from the Huamachuco region itself (John R. Topic, personal communication February 12, 2008).

The large site of Namanchugo, in use from ca. 400 C.E. – 1555 C.E., has been identified as the main shrine dedicated to the worship of Catequil. It is located on a small plain facing the mountain of Cerro Icchal (Figure 2). Although Namanchugo was initially open to elites and commoners alike, around 1200 C.E. a major transformation appears to have taken place, whereby the shrine was formalized and non-elites were restricted. For the purposes of my study I analyzed the Early and the Late phases of occupation at Namanchugo as separate sites because extensive mixing from the site’s construction phases has meant that the exact chronology cannot be determined, but the early and late phases can be well discerned (Topic et al. 2002). This allows for a generalized but useful chronological comparison. After Namanchugo became more formalized and restrictive around 1200 C.E. the contemporary site of Cerro Icchal came into use as a lower-class shrine dedicated to Catequil worship, visited by pilgrims who were no longer welcome at the main shrine. It was in use until 1532 C.E. (Topic 2008; Topic et al. 2002).
The two remaining sites have been interpreted as support centers for the main shrine at Namanchugo. Chulite, in use from ca. 600 – 1200 C.E., likely provided housing for lineages visiting Namanchugo during the ritual season; daily domestic activities would have taken place here, as well as feasting and preparations for the rituals at Namanchugo. Lastly, Chuquicanra was in use from ca. 500 – ca. 1450 C.E., and this site is thought to be the permanent, year-round residence of a caretaker population for the shrine (Topic 2008; Topic et al. 2002). I have only been able to offer very brief accounts of these sites, but this provides a necessary context for understanding the lithic assemblage at Porcón.

The Lithic Assemblage

The primary goal of my analysis was to describe the assemblage from Porcón. It is estimated that over 10,000 chipped lithic artifacts have been recovered to date from the four sites, so I chose a systematic sample of these in order to represent the entire assemblage. One problem with this sampling technique is that, while it is good for covering the entire assemblage of each site in general, it does not allow for accurate identification of intra-site variation or chronological variation. This was complicated by extensive mixing at each of the sites, making the
excavators unsure of the primary contexts of most deposits (John R. Topic, personal communication, February 12, 2008), although an Early and a Late phase at Namanchugo could be discerned, as has already been noted. Also, the site of Chulite was roughly contemporaneous with Early Namanchugo, the site of Cerro Icchal was contemporaneous with Late Namanchugo, and the site of Chuquicanra spanned the early and late phases to an extent. Therefore, for the purposes of my analysis, I treat each site as a separate sub-assemblage within the overall Porcón lithic assemblage, and I treat Early and Late Namanchugo as two separate sites.

I examined all chipped lithic cores, tools, and debitage, and also made note of hammerstones. Tools were usually indistinguishable from debitage, both being unmodified flakes; therefore tools were defined as flakes that either displayed evidence of intentional retouch, evidence of use-related edge damage, or both. Each individual artifact was weighed and length, width, and thickness/depth were measured on cores and tools. The raw material type and several production-related attributes were recorded for all cores and flakes (whether tools or debitage), and tools were also subjected to low-power use-wear analysis which, when combined with a morphological analysis of the tool’s edge, allowed me to infer the probable function of the tool in very general terms. Many of these attributes lead to unclear or contradictory interpretations, however several proved to be useful and are discussed below. In total, I analyzed a sample of 1,910 artifacts, consisting of 340 lithic cores, 1,248 debitage flakes, and 322 tools (Table 1). Forty-two hammerstones were also observed, but will not be discussed here.

The Expediency of the Assemblage

The lithic assemblage at San José de Porcón was very informal and was clearly not a curated assemblage, but rather spoke of expedient and unskilled lithic reduction strategies. Nearly all of the 322 tools observed in my sample were informal flake tools (see Figure 3 for a typical assortment of tools). Bifacial reduction was entirely absent from the sample, and only a handful of flakes were modified prior to use. Intentional retouch was rare and never invasive, and 81% (n=261) of tools displayed no retouch whatsoever. There was only a single formal tool observed in the sample, an obsidian biface from Early Namanchugo that was used either as a projectile point or a hafted knife, and it was likely a high-status item, possibly used in a ceremonial role. This biface was probably made elsewhere and was not further modified at Porcón, an interpretation that is supported by the fact that no obsidian debitage was observed in the sample. While the stone source of this biface has not yet been determined, there are no known sources of obsidian in northern Peru and other obsidian artifacts in the Huamachuco region have been traced to sources in the department of Ayacucho, hundreds of kilometers to the south (Burger and Asaro 1977). The exotic nature of
this biface supports the idea that it was a high-status good, but the possible ceremonial uses of obsidian in the Huamachuco region and elsewhere in the Andes have not been studied to date.

I also analyzed all cores and flakes in order to describe core reduction strategies and general lithic production techniques. All cores were reduced in a non-standardized manner, whereby the knapper struck flakes opportunistically from all around the core, expediently producing a pile of flakes with no predetermined size or shape. Flakes were likely then chosen from this pile based on whatever flake was most suitable for the task at hand. These flakes were then used without further modification and the remaining unsuitable flakes were discarded as debitage. Very few pressure flakes were observed and there was no indication amongst the debitage that bifacial reduction took place anywhere at Porcón, and no evidence of a blade core technology was observed. All four sites produced lithic artifacts in fundamentally similar ways, and there were no major differences between the early and late phases of occupation at Porcón. In fact, the early and the late phases of Namanchugo were generally much more similar to each other than either was to the other sites, indicating that although Namanchugo underwent major sociopolitical changes at ca. 1200 C.E., lithic technology remained largely unaffected. Given these patterns, I suggest that lithic production at Porcón was very expedient and informal, consistent with the pattern seen throughout Andean complex societies, and indeed fitting models of lithic use in sedentary societies in general. Furthermore, it is likely that lithic producers were by and large unskilled and were not specialized lithic craft producers.

What can we do with expedient lithics?

Given the overall expediency of the assemblage, it may seem as though no clear patterns can be observed throughout the assemblage. On the contrary, I was able to determine some interesting patterns regarding lithic function, raw material selection, and potential production locations by considering how several variables intersected. I will briefly describe these here in order to show some of the ways that we can derive social information from expedient lithic artifacts.

Table 1. Quantity of lithic artifact types at Porcón, divided by site.

<table>
<thead>
<tr>
<th></th>
<th>Early Namanchugo</th>
<th>Late Namanchugo</th>
<th>Chulite</th>
<th>Chuquicanra</th>
<th>Cerro Icchal</th>
<th>Assemblage Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cores</td>
<td>158</td>
<td>76</td>
<td>48</td>
<td>33</td>
<td>25</td>
<td>340</td>
</tr>
<tr>
<td>Tools</td>
<td>139</td>
<td>87</td>
<td>36</td>
<td>17</td>
<td>43</td>
<td>322</td>
</tr>
<tr>
<td>Debitage</td>
<td>589</td>
<td>180</td>
<td>145</td>
<td>175</td>
<td>159</td>
<td>1248</td>
</tr>
<tr>
<td>Site Total</td>
<td>900</td>
<td>347</td>
<td>233</td>
<td>244</td>
<td>228</td>
<td>1910</td>
</tr>
</tbody>
</table>
Figure 3. Typical examples of informal flake tools from Namanchugo. The second tool from the right is quartzite and the other three are common types of chert.

Tool function is one well-studied aspect of informal lithic tools. I conducted a use-wear analysis using low-power microscopy for all of the lithic tools observed in my assemblage. The results of this analysis were combined with a morphological analysis of the tool’s used margins to infer the function of each tool in very general terms (Table 2). Not surprisingly, meat butchering and preparation was the most common tool function throughout the Porcón assemblage, with 85% (n=273) of all tools exhibiting evidence that they were used for cutting a soft material—most likely meat—for at least one of their tasks, but many tools were used for multiple tasks. Other common functions were hide scraping and use for preparing hard plants (perhaps shaping wood). The general patterns of use remained consistent across the sites. Despite these general inferences, the exact tool functions remain unclear, in part because we do not know exactly what tasks would have required lithic cutting implements at Porcón. Camelids, guinea pig, and deer were consumed at the site (Vásquez Sánchez and Rosales Tham 2004, 2006) and presumably the majority of lithic tools were used
Table 2. Quantity of tools used for each task, organized by site. Note that many tools had more than one task associated with them, so the frequency given is the number of tools that had that task as one of their potential uses.

<table>
<thead>
<tr>
<th>Function</th>
<th>Early Namanchugo</th>
<th>Late Namanchugo</th>
<th>Chulite</th>
<th>Chuquicanra</th>
<th>Cerro Icchal</th>
<th>Assemblage Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Soft Cutting</td>
<td>126</td>
<td>91.3</td>
<td>61</td>
<td>70.1</td>
<td>31</td>
<td>86.1</td>
</tr>
<tr>
<td>Chopping</td>
<td>10</td>
<td>7.2</td>
<td>5</td>
<td>5.7</td>
<td>10</td>
<td>27.8</td>
</tr>
<tr>
<td>Scraping</td>
<td>23</td>
<td>16.7</td>
<td>20</td>
<td>23.0</td>
<td>2</td>
<td>5.6</td>
</tr>
<tr>
<td>Notched</td>
<td>12</td>
<td>8.7</td>
<td>7</td>
<td>8.0</td>
<td>2</td>
<td>5.6</td>
</tr>
<tr>
<td>Sawing</td>
<td>5</td>
<td>3.6</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Hard Plant</td>
<td>14</td>
<td>10.1</td>
<td>8</td>
<td>9.2</td>
<td>16</td>
<td>44.4</td>
</tr>
<tr>
<td>Hard Material</td>
<td>4</td>
<td>2.9</td>
<td>4</td>
<td>4.6</td>
<td>5</td>
<td>13.9</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>4.3</td>
<td>10</td>
<td>11.5</td>
<td>1</td>
<td>2.8</td>
</tr>
<tr>
<td>Total No. of Tools</td>
<td>138</td>
<td>87</td>
<td>36</td>
<td>17</td>
<td>17</td>
<td>43</td>
</tr>
</tbody>
</table>

for butchering and processing these animals, but it is uncertain whether chipped lithic tools would have been required for other tasks, such as crop harvesting, hide scraping, or wood working. Although the use-wear analysis only shows general patterns in terms of tool function, it provides useful information regarding the role that lithic technology played throughout the Porcón region and represents one avenue of analysis that can provide fruitful information derived from the study of informal lithic tools.

A common inquiry in the archaeology of complex societies concerns the status that can be attributed to certain classes of artifact. For instance, knowing whether an artifact is a low-status domestic good versus a high-status ceremonial item can lead to important social inferences, but determining the status of informal tools can be difficult. One of the most reliable avenues of inquiry for determining the status of informal goods stems from the distance that any given raw material travels to get to the consumer (Gero 1989). Lower-class members of the society are more likely to only be able to “afford” materials that come from nearby sources—either collected by the consumer or obtained through regional exchange networks—whereas higher-class members will presumably be able to obtain materials that come from further away. Elite members of the society may seek to obtain distant materials because they are better quality than local ones, because they have a certain social or cultural significance, or to show their ability
to obtain rare materials. It follows that more-distant, higher-status raw materials will be curated to a greater extent than the local stones, and will therefore be used more efficiently than the cheaper local ones. This is demonstrated at Porcón by the fact that the only formal tool was made from obsidian, a material that was certainly obtained through very long-distance trade. However, the other raw materials also suggest this pattern, although not as clearly. Chert and quartzite were the most common raw material types throughout the assemblage, while other materials were rarely used. Interestingly, chert outnumbers quartzite at all sites except Cerro Icchal, where quartzite is considerably more abundant (Figure 4). In general, quartzite is a poorer-quality raw material than chert; quartzite would have been more difficult to knap, and it would have had duller edges that made the tool harder to use. This indicates that the inhabitants of Cerro Icchal were restricted access to higher-quality stones like chert, and it supports the identification of this site as a lower-class shrine for worshippers who were denied access to Namanchugo.

A second part of this inquiry involves the extent to which these materials were maximized. Core reduction was very wasteful throughout the sample assemblage, but chert was maximized more regularly than quartzite was. This is particularly evident with bipolar reduction. Throughout the sample, 73% (n=249) of cores were reduced through bipolar percussion techniques, but only 28% (n=435) of the flakes were reduced using the same method. This strongly suggests that cores were originally reduced through free-hand percussion—offering more control and producing better-quality flakes than bipolar percussion—and were then finished off using bipolar percussion in order to obtain as many flakes as possible from the core. Thus, bipolar reduction was ultimately done as a maximizing technique, an interpretation that has previously been used to explain the presence of bipolar reduction in expedient lithic reduction strategies (Parry and Kelly 1987).

Furthermore, chert cores were reduced through bipolar means far more regularly than quartzite cores were (Figure 5), suggesting that chert was maximized more than quartzite, presumably because chert was a higher-value raw material. Andrefsky (1994) discussed a similar pattern found amongst lithic cores in the Calispell Valley of Washington State. Poor-quality schist and quartzite were locally available in the valley and both were used for lithic production, but higher-quality raw materials such as chert and obsidian did not occur naturally in the area (Andrefsky 1994: 378). Andrefsky showed that the non-local raw materials were usually reduced through bipolar percussion techniques, whereas the local schist and quartzite were rarely reduced in this same manner. This lead Andrefsky to conclude that bipolar reduction was used in the Calispell Valley to maximize the amount of material that could be obtained from higher-quality non-local raw materials, whereas the local materials were not maximized because they
Figure 4. Raw material frequencies by site. Note that quartzite is more abundant than chert only at the site of Cerro Icchal.

were readily available (Andrefsky 1994: 386). The pattern of raw material reduction at Porcón follows Andrefsky’s model very well.

I suggest that the raw material reduction strategies at Porcón are best explained by considering quartzite as a local, low-status raw material that was likely collected at the source by the knappers themselves, and chert as a more distant material that held greater value than quartzite and was obtained through regional exchange networks. If accurate, this pattern supports the interpretation that Cerro Icchal, where quartzite is dominant, was a low-class site in comparison to its contemporary at Namanchugo. Of course, raw material sourcing can shed enormous light on this argument. Lithic sourcing was beyond the scope of this project, but local geological maps indicate that there is no chert in immediate proximity to the Porcón region (Cossio 1964; Reyes 1980) and it is likely that multiple chert sources were exploited. The quartzite-bearing Chimú Formation outcrops extensively in the Porcón region (Cossio 1964; Reyes 1980), and it is possible that quartzite can be found on the mountain of Cerro Icchal itself.
Figure 5. Frequency of core reduction techniques for chert and quartzite. The observed ratios are statistically-significant at the 95% confidence interval ($X^2$, df=1, $p=4.849\times10^{-5}$).

Although archaeological fieldwork is required to locate precise raw material sources in the region, it is reasonable to suggest that quartzite is locally available while chert is not. By examining the raw material type and production attributes such as the presence of bipolar knapping, some important interpretations can be discerned from very expedient and informal artifact types. While this pattern indicates that certain stone types held a greater value than others, there was no appreciable difference in how chert and quartzite tools were ultimately manufactured or used, beyond the maximizing technique of bipolar reduction on chert.

Lithic production and use both took place in abundance at every site and no specific lithic workshops could be identified, but I suggest that Chuquicanra was more of a production-intensive site while Late Namanchugo was more use-intensive. This is discerned by observing the ratio of the three artifact types at each of the sites. Particularly relevant here is the ratio of production-related items (cores and debitage) to tools. There is a similar ratio of production items to tools at Early Namanchugo, Chulite and Cerro Icchal, suggesting that most of the tools produced at those sites were also used there, but Late Namanchugo has a significantly greater quantity of tools than expected while Chuquicanra has significantly fewer tools than expected ($X^2$, df=4, $p=9.994\times10^{-7}$; Table 3). Chuquicanra also has more production-related artifacts than expected while Late Namanchugo has fewer, but these relationships are not statistically significant (Figure 6). This suggests that Chuquicanra was producing lithic tools that were used elsewhere, and that late Namanchugo was using tools that were produced elsewhere. There is not enough data to definitively say that Chuquicanra produced tools for use at Namanchugo, but this is a presumption that warrants further
testing. If this model is correct, then this supports the interpretation that Late Namanchugo was primarily for high-status members of society, and other attributes lend support to this conclusion. Late Namanchugo has a greater-than-expected quantity of flakes that were produced using soft-hammer percussion and fewer that were produced through bipolar percussion when compared to the other sites where chert was the abundant raw material, suggesting that more attention was paid to how flakes were produced at the site and possibly indicating that better-quality raw materials were available at Late Namanchugo. Late Namanchugo also may have attracted better-skilled knappers (or obtained flakes made by better-skilled knappers at Chuquicanra). I determined knapping skill using the flake termination of informal tools. Flakes with feather terminations will be preferred for use over those with hinges, steps, or plunging terminations, and these latter three will be more frequent when the knapper is less-skilled, using poorer-quality raw material, or both. Late Namanchugo has a significantly greater quantity of feather terminations than Chulite and Chuquicanra, which have a significantly greater quantity of the other three termination types, and this pattern supports the idea that Late Namanchugo attracted better-skilled knappers (or flake tools manufactured by skilled knappers) and reinforces the idea that it was a higher-status site. This is all very inferential, but these attributes indicate possible avenues by which we can access important social information using lithic artifacts that, at their outset, do not appear to lend any assistance in their interpretation.

**Summary and Conclusions**

In this analysis I considered several key attributes regarding informal lithic technology at four sites associated with the Oracle of Catequil near the village of San José de Porcón in the northern highlands of Peru. In general, lithic technology was very expedient throughout the entire Porcón assemblage, with informal flake tools comprising nearly the entire sample. My analysis examined a wide array of quantitative and qualitative attributes and included low-level microscopic use-wear analysis. For the most part these analyses did not convey much social information beyond showing the informal and expedient nature of the assemblage. Still, through a detailed analysis of these attributes I demonstrated that, despite the overall expediency of the assemblage, there were some interesting patterns that could be discerned. These patterns indicate that informal lithic technologies can convey important social information.

Use-wear analysis was conducted to determine lithic functions at Porcón and this indicated that the cutting of soft materials, most likely meat, was the primary task carried out using chipped lithic tools, suggesting that lithics played a relatively minor role in craft production or in other economic realms. This makes sense given that the sites at San José de Porcón were primarily the locus of
Table 3. Chi-Square analysis of production-related items (i.e. cores and debitage) and tools, organized by site. These results are statistically significant ($X^2$, df=4, p=9.994x10^-7) and show that Late Namanchugo has significantly more tools than expected while Chuquicanra has significantly fewer. Chuquicanra also has a greater-than-expected quantity of production-related items while Late Namanchugo has fewer than expected, but these results are not statistically significant at the 0.05% confidence level.

<table>
<thead>
<tr>
<th>Site</th>
<th>Artifact Type</th>
<th>Observed Frequency</th>
<th>Expected Frequency</th>
<th>Value</th>
<th>Residual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Namanchugo</td>
<td>Production</td>
<td>747</td>
<td>736.63</td>
<td>0.15</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>Tool</td>
<td>139</td>
<td>149.37</td>
<td>0.72</td>
<td>-0.85</td>
</tr>
<tr>
<td>Late Namanchugo</td>
<td>Production</td>
<td>256</td>
<td>285.17</td>
<td>2.98</td>
<td>-1.73</td>
</tr>
<tr>
<td></td>
<td>Tool</td>
<td>87</td>
<td>57.83</td>
<td>14.72</td>
<td>3.84</td>
</tr>
<tr>
<td>Chulite</td>
<td>Production</td>
<td>193</td>
<td>190.39</td>
<td>0.04</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Tool</td>
<td>36</td>
<td>38.61</td>
<td>0.18</td>
<td>-0.42</td>
</tr>
<tr>
<td>Chuquicanra</td>
<td>Production</td>
<td>208</td>
<td>187.07</td>
<td>2.34</td>
<td>1.53</td>
</tr>
<tr>
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<td>Tool</td>
<td>17</td>
<td>37.93</td>
<td>11.55</td>
<td>-3.40</td>
</tr>
<tr>
<td>Cerro Icchal</td>
<td>Production</td>
<td>184</td>
<td>188.73</td>
<td>0.12</td>
<td>-0.34</td>
</tr>
<tr>
<td></td>
<td>Tool</td>
<td>43</td>
<td>38.27</td>
<td>0.58</td>
<td>0.76</td>
</tr>
</tbody>
</table>

Note: Residual values greater than 1.96 and lesser than -1.96 indicate statistically significant variations in the observed frequency from the expected frequency at the p=0.05 significance level. Positive residuals values indicate that the observed frequency is greater than the expected frequency whereas negative residual values indicate that the observed frequency is lower than the expected frequency.

Figure 6. Ratio of production items (cores + debitage) to tools for each site. Note that there is a particularly high ratio of production items to tools at Chuquicanra while this ratio is particularly low at Late Namanchugo.
occasional pilgrimages and associated ritual and ceremonial activities, and were not the permanent habitation or work areas of most of their inhabitants. Another avenue of analysis allowed me to support previous interpretations at Porcón that suggested that Late Namanchugo was the center of a formalized, elite shrine, while the site of Cerro Icchal was a contemporary lower-class shrine. I supported this interpretation by first showing that Cerro Icchal primarily used a lower-quality raw material—quartzite—for its stone tools, while Late Namanchugo and the other sites used chert most abundantly. Chert was maximized through bipolar reduction to a greater degree than was quartzite, suggesting that chert was a more valuable raw material than quartzite and may have been a more-distant resource as well. Based on this analysis it appears that the site of Cerro Icchal had restricted access to better-quality, more-distant, and greater-valued raw materials such as chert, supporting the interpretation that it was a lower-class shrine. Finally, I suggested that the site of Late Namanchugo had enough influence to obtain lithic tools from elsewhere and was largely focused on tool use rather than tool production, consistent with the interpretation that it was a high-class shrine. I also suggested that Chuquicanra was a production-intensive site, possibly supplying tool flakes to Late Namanchugo. This conclusion was derived primarily through comparison of the quantities of lithic artifacts at these two sites, and I suggest that this supports the interpretation that Late Namanchugo was an elite shrine.

While these same attributes and analyses will not be useful for every informal lithic assemblage, it is imperative to consider all of the possible methods that may be used to obtain social information from informal lithic technologies. These may include attribute-based analyses or functional analyses such as use-wear, and it is important to remain open to discovering unexpected but meaningful patterns. For instance, the abundance of quartzite at Cerro Icchal was unexpected, but provided some interesting and useful conclusions. I suggest that one of the most fruitful—and simplest—avenues of study is the comparison of the quantities of different artifact types across meaningful contexts. At San José de Porcón this proved to be one of the most useful ways to approach the assemblage. This simple task can provide important information on its own, and can guide researchers to specific contexts that warrant further analysis.

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