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Abundant Exotics and Cavalier Crafting: Obsidian Use and Emerging Complexity in the Northern Lake Titicaca Basin

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During the Middle Formative (1300–500 BC) and Late Formative periods (500 BC–AD 300), Taraco and Pukara became major centers in the northern Lake Titicaca Basin of Peru. Recent research has revealed similar economic patterns for both sites that included the exploitation of vast trading networks through camelid caravans. These trade networks were responsible for the importation of obsidian from the Chivay and Alca sources, located approximately 200 km to the west (figure 7.1). Although it is exotic (non-local) to the basin, obsidian is overrepresented in excavated contexts at both Taraco and Pukara, and its purposeful accumulation corresponds with increased investment in corporate architecture and supra-household food sharing during the Late Formative. At Taraco, an increase in relative frequency of obsidian corresponds chronologically with its apogee as a regional center. Contemporaneously, a complete analysis of lithic collections from excavated contexts at Pukara shows that obsidian was so plentiful that craftspeople made no effort to conserve or recycle it. We argue that this wasteful behavior reflects resource abundance and the status of these centers as primary nodes in region-wide obsidian exchange networks. These results highlight the role relatively rare, non-local utilitarian products might play in the formation of regional centers and multi-community polities and underscore the fluidity of value within the prestige economy during the earliest periods of social complexity.

As outlined by Monica Smith in this volume, a focus on both actual and perceived scarcity has driven archaeological research across time periods and geographical

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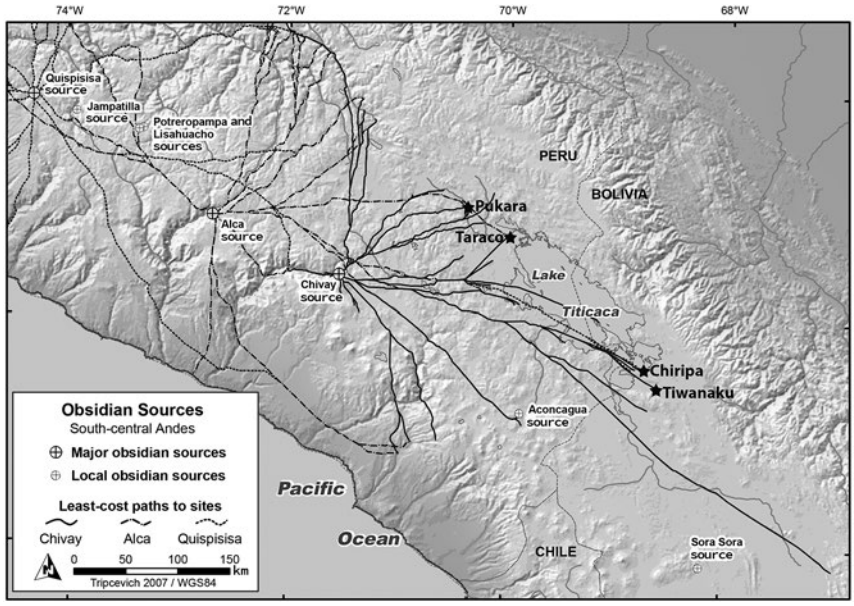

Figure 7.1. Major obsidian sources in the South-Central Andes (Chivay, Alca, and Quispisisa) and the least-cost paths to archaeological sites in the Lake Titicaca Basin (adapted from Tripcevich 2007:figure 3.5, p. 181).

settings. In the case of lithic raw materials, their limited geological distribution often translates to assumptions of scarcity. The presence of such materials in archaeological contexts distant from their sources triggers a series of questions related to control, conservation, and restriction at each stage of the chaîne opératoire predicated on the materials' apparent scarcity. This chapter looks at this issue in a different light and examines a case in which a geologically restricted material—obsidian—appears in relatively large percentages in burgeoning regional centers far from its sources. This unexpected abundance of an exotic good in both public and private settings at these centers presents a unique opportunity to think about perception, meaning, and decision-making in new ways. Seeking explanations for abundant non-local lithic raw materials, production debris, and finished tools can provide new insights into the nature of trade networks, the organization of craft production, the development of prestige economies through conspicuous consumption and costly signaling, and the origins of sociopolitical complexity in the Lake Titicaca Basin of highland Peru.

Andean archaeologists have traditionally focused on the relationship among resource control, interregional exchange, and sociopolitical organization because

of the region's intensely vertical nature. Like other mountainous environments, there is significant variability of available natural resources in each of the "stacked" ecological niches of the Central Andes. Climatically sensitive crops such as cotton thrive in the irrigated valleys of the coastal dessert, maize is found primarily in the mid-elevation highlands, and the highest elevations are home to potatoes, quinoa, and other frost-resistant crops (Seltzer and Hastorf 1990). The diversity of this landscape has inspired decades of debate about the nature of trade and transhumanance across these vertically differentiated ecological niches. Models of vertical complementarity for subsistence exchange (Murra 1972, 1985) have inspired other models, such as horizontal complementarity (e.g., Browman 1977), and have been the subject of more generalized critiques (e.g., VanBuren 1996). While these models are of theoretical value, they often fail to consider goods that radiate diffusely across ecozones from a single source, such as salt and obsidian (Tripcevich 2007:figure 3.4; Yacobaccio et al. 2002:168; cf. Burger and Asaro 1977, 1978, 1979 and Tripcevich and Contreras 2013 for the history of Andean obsidian research).

Objects made of obsidian are extremely useful, highly visible, and chemically sourceable, and they have considerable time depth in the archaeological record of the Central Andes. Over the last two decades there has been new interest in obsidian research in the Central Andes that addresses quarrying, processing, circulation, and consumption behaviors while applying a variety of innovative methodological and theoretical approaches (Brooks, Glascock, and Giesso 1997; Burger, Chávez, and Chávez 2000; Burger et al. 1998; Craig et al. 2010; Giesso 2003; Jennings and Glascock 2002; Stanish et al. 2002; Tripcevich 2007, 2010; Tripcevich and Contreras 2011, 2013; Tripcevich and Mackay 2012). Among the most important developments were technological advances enabling the relatively rapid—and fairly low-cost—geochemical characterization of large quantities of obsidian. Technologies such as portable X-ray fluorescence (PXRF), which permit nondestructive in situ analysis of archaeological materials, have resulted in a proliferation of compositional studies in recent years and have been especially useful for monitoring patterns of quarrying and circulation of artifacts in the Andes and elsewhere (e.g., Craig et al. 2007; Shackley 2011).

This chapter integrates detailed artifact analysis with site-level contextual information and geochemical sourcing to explore the economic and social value of obsidian at Taraco and Pukara, two early regional centers in the northern Lake Titicaca Basin. Obsidian is an exotic material to this region but is found in relative abundance in recent excavations at both sites. Informed by recent research on regional obsidian circulation by Nicholas Tripcevich (2007:2), we use these data to assess whether obsidian was viewed as a precious commodity (like gold or lapis lazuli) or a utilitarian product (like salt) during the Middle and Late Formative periods in

the northern Titicaca Basin. Together, these data further permit examination of the ways abundance figures across the multiple cooperative and competitive strategies associated with emergent social complexity.

REGIONAL CONTEXT

The Lake Titicaca Basin is a vast, high-elevation plateau ringed by the high peaks of the Andean cordilleras. Spanning the modern political borders of Peru and Bolivia, the lowest point in the basin is the lake itself, which sits at an altitude of 3,810 m above sea level. Despite a generally frigid climate and the stark conditions typical of high-altitude environments, the Titicaca Basin is a highly productive ecological zone that supports a large biomass. Tropical latitudes and a pronounced rainy season enable intensive cultivation of a variety of tubers, chenopods, and legumes on arable plains and hillsides. Expansive grasslands support large herds of both wild (vicuña and guanaco) and domesticated (llama and alpaca) camelids. The cultural developments of the Titicaca region played out in this geographical context that favored the agriculturally rich far northern and far southern areas. In the north, this region was centered in the corridor along the lake and up the rivers from Huancané through Taraco, Azángaro, and Pukara. In the south, this region is bounded through the Taraco Peninsula, Tiwanaku, and the Jesus de Machaca region.

From its earliest settlement ca. 7000 BC, wild camelid herds attracted the first nomadic foraging populations to the Titicaca Basin during the Archaic period (figure 7.2). Domesticated llamas then served as valuable pack animals, facilitating long-distance interregional exchange and contributing to the establishment of sedentary agropastoralist villages in the region. Agropastoral economies flourished in the region for millennia, leading to the development of small settled villages in the Early Formative (2000–1300 BC). A few of these settlements experienced significant growth and differentiation during the Middle Formative, a period characterized by intense political and economic expansion in the region as a whole. This competitive trend ultimately culminated with the formation of the first regionally expansive polities by the Late, or "Upper," Formative.[1]

Pukara and Taraco were at the heart of two such polities competing for regional dominance during the late Middle and early Late Formative periods. The aggregation of populations into these relatively dense political centers represents one of the most important transitions in the history of complex societies in the region (Levine 2012). In addition to their large size and the presence of corporate architecture, these centers are further distinguished by the relative abundance of specialized craft goods—primarily polychrome pottery and intricately carved stone sculptures—and of non-local objects and exotic raw materials, including obsidian

Date	Northern Titicaca Basin	Chronological Stage	Ica Sequence
AD 1500	Inka	Expansive Inka	Late Horizon
	Colla	Regional period	Late Intermediate period
1000	Late Huaña Tiwanaku	Expansive Tiwanaku	Middle Horizon
500	Early Huaña		
AD/BC	Pukara	Late/Upper Formative	Early Intermediate period
500	Cusipata	Middle Formative	Early Horizon
1000	Qaluyu		
1500		Early Formatiive	
2000 BC		Late Archaic	

Figure 7.2. Chronological chart for the Lake Titicaca Basin (adapted from Levine 2013).

(Burger, Chávez, and Chávez 2000; see discussion in Plourde 2006). Collectively, these features constitute the Yaya-Mama Religious Tradition, a pan–Titicaca Basin elite ideology associated with the earliest complex cultures of the region (Chávez 1988; Chávez and Chávez 1975; Stanish 2003).

Taraco

As a major Middle and Late Formative period center with an uninterrupted occupational sequence, the archaeological site of Taraco in the far northern basin is ideal for studying the evolution of war and trade, two major processes associated with emergent complexity (Levine et al. 2013; Stanish and Levine 2011). The site is located along the Ramis River in the eponymous modern town approximately 15 km north of the lake, and it remained prominent in the region through subsequent Inca times, when it was mentioned in Spanish chronicles. Though few remains of the site are visible on the surface today, scholars have long noted the significance of the greater Taraco area, which is famous for the quantity and quality of its monoliths and exquisite examples of lithic art (Kidder 1943; Rowe 1942; Tschopik 1946).

Notably, these include the iconic half-male, half-female Yaya-Mama stela after which the cultural tradition was first described (Chávez and Chávez 1970, 1975).

In the systematic survey of more than 1,000 km^2 in the Huancané, Putina, Taraco, and Arapa zones, the mound at Taraco stands out because of its comparatively large size (Stanish and Umire 2004). A dense cluster of contemporary settlements, linked by a network of roads and possibly causeways, surrounds the principal mound, and together these form the Taraco site complex. As represented by survey data, the entire area of Middle and Late Formative occupation totals well over 100 hectares, making the size of the Taraco site complex several orders of magnitude greater than any of its neighbors.

Excavations in three of the eighteen mounds in the Taraco area have further revealed the importance of the site area in the history of the northern Titicaca Basin (figure 7.3). The majority of this attention has been focused on the principal mound, known as Area A (de la Vega 2005; Levine 2012, 2013). Excavations of a high-status residential area on a large (approximately 2 hectares) artificial terrace just below the highest part of the modern town exposed a stratified cultural sequence that included architectural fill episodes, midden accumulations, and buildings that were remodeled, disassembled, or destroyed. From this work, it was determined that Area A was characterized by eight occupational phases that dated from as early as 1200 BC and continued through the modern day (Levine 2012). The earliest three occupational phases (termed Phases 1, 2, and 3) date to the Formative eriod, and the latest (Phase 3), dating to approximately AD 100, corresponds with Early Pukara (Levine et al. 2013). Each of these occupations was associated with a building made of fine stone, with the two later occupations superimposed over the earlier ones. While largely domestic in character, the three Formative occupations were also associated with relatively high levels of prestige and exotic goods, including highly decorated ceramic ceremonial wares such as trumpets and braziers, as well as obsidian, indicating that they were also the locus of periodic ritual and civic-ceremonial activity (Levine 2012).

Levine's analysis of the excavation data and associated materials finds indicated that Taraco achieved its political and economic status through early residents' strategic participation in long-distance trade networks used to import exotic goods, such as obsidian, from the Colca Valley (Levine 2012; Levine et al. 2013). In its earliest phases, Taraco, ideally situated along a number of trade routes, likely functioned as a "transit community" (Bandy 2005), with individual households hosting passing caravans in exchange for "presents" of exotic goods. Preferential access to these resources allowed residents to accumulate the durable wealth required for local faction building and political expansion (Levine 2012). By the middle of the Upper Formative, this imported wealth was financing a thriving political economy:

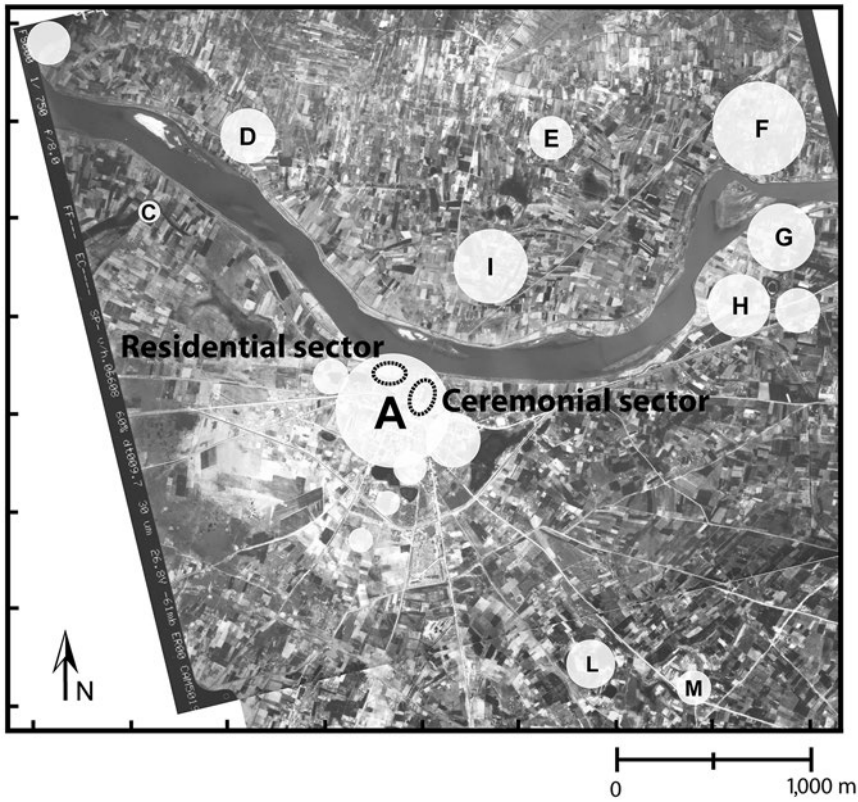

Figure 7.3. Taraco site map.

excavation of the terrace and the adjacent ceremonial sector (see figure 7.3 for sector locations) revealed abundant evidence of public ceremonial activities featuring music and the burning of incense and of large-scale community-sponsored feasts (Levine 2013; Levine et al. 2013). These events built and strengthened alliances among participants; attendees were granted access to exotic goods, and gifts of high-status crafted goods materialized social bonds, created indebtedness, and demonstrated hierarchy. In other words, this wealth allowed early residents of Taraco to "buy into" pan-regional ideologies, including the Yaya-Mama religious tradition. During the early Late Formative, these strategies successfully attracted populations from around the north basin and likely beyond (Levine 2012).

Taraco's economic and political success was ultimately short-lived, however, as the Phase 3 occupation was associated with a major burn event that destroyed the entire residential sector in the first century AD. Evidence of this episode was

detected in all areas tested, including each of the excavation units, as well as in a profile cut along the river edge that revealed a continuous stratum of ash and architectural debris stretching for more than 35 m. Stanish and Levine (2011) have argued that this event represents evidence for intensive raiding, most likely by the Pukara polity and its allies, as the dates of this burn event correspond chronologically with dates from "pure Pucara style rubbish" excavated by Kidder at the site of Pukara.

Pukara

By the first century AD, the majority of northern basin populations fell under the influence of the Pukara polity, with its center at the monumental site Pukara (figure 7.4). This major civic ceremonial center was approximately 80 km northwest of the lake and 50 km from Taraco. In the center of the site's core is the Qalasaya, a stone-lined platform mound topped by three sunken court complexes. It is situated at the base of a massive pink sandstone outcrop and is surrounded by a number of plazas, platforms, and artificial mounds. More modest residential architecture and dense middens of production debris and fragmentary finished goods characterize the periphery of the site. Unfortunately, because of the spatial overlap of prehistoric Pukara and the modern town of Pucará, it is challenging to determine if the Formative period settlement was continuous between the core and periphery areas.

A systematic settlement survey of the Pukara River Valley provides valuable insights into the timing of the reorganization of local populations and the expansion of Pukara. Cohen (2010) documented an abrupt settlement shift as Middle Formative villages were abandoned and the majority of the population relocated to Pukara during the Late Formative. Based on intensive site-level survey, Pukara expanded to cover over 200 hectares at its apogee during the Late Formative (Klarich and Román Bustinza 2012). Excavations by Alfred Kidder II in 1939 (Chávez 1992; Inojosa 1940; Kidder 1942), by UNESCO's Plan COPESCO in the 1970s (Mujica 1978, 1985, 1988, 1991; Wheeler and Mujica 1981), and most recently by the Pukara Archaeological Project (2000–present) have worked to establish the scale, spatial organization, and occupational history of Pukara, which spans from the Middle Formative to the Spanish colonial period (Abraham 2012; Klarich 2005a, 2005b, 2009; Klarich and Román Bustinza 2012; Oshige Adams 2012).

The Pukara Archaeological Project has targeted a number of areas within the civic ceremonial core and on the site periphery for intensive surveys, mapping, and excavations over the last decade. We have focused primarily on documenting the timing and directionality of site growth, and earliest dates thus far are from contexts within the civic ceremonial core. The lithic data presented in this discussion were recovered from a series of Late Formative period contexts in three excavation

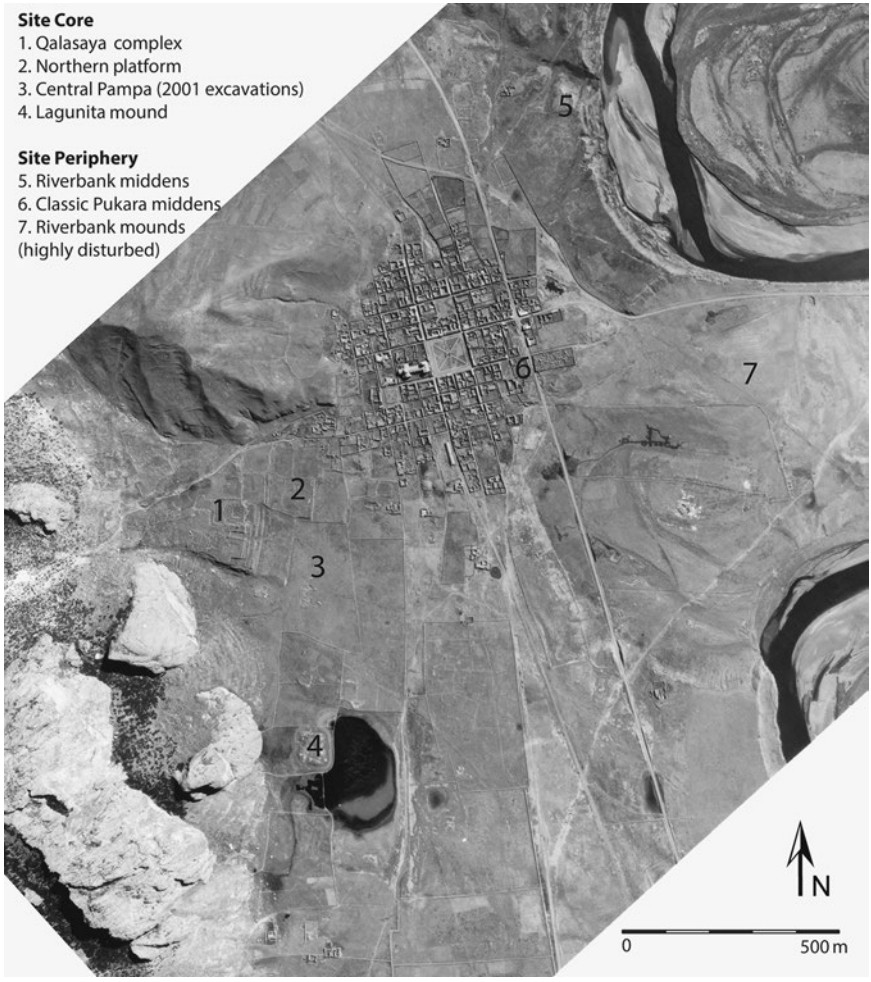

Figure 7.4. Pukara site map.

blocks on the Central Pampa, a large open space at the base of the Qalasaya terraces. While there was variability in the range of specific activities documented in each block, based on stratigraphic relationships and diagnostic pottery it was possible to group them broadly into initial, middle, and final occupations that all dated to the Late Formative period.[2] The initial contexts were characterized as outdoor activity areas with little evidence of long-term use. In contrast, during the middle and late occupations the pampa area was transformed into a residential sector with a diversity of architectural spaces and activity areas. Lithic materials were recovered from

middens and work surfaces, reflecting a broad range of domestic and ritual activities in this non-elite residential context (see Klarich 2005a).

Based on the analysis of architectural data, activity areas, and associated artifacts, it was clear that the Central Pampa served a number of diverse functions within the civic ceremonial core during the Late Formative, a time period that can be further subdivided into Early, Middle (or Classic), and Late Pukara periods (Klarich 2005a, 2005b, 2009). In the Early Pukara period, the Central Pampa served as a plaza space used for the preparation and consumption of supra-household meals. The plaza abutted an earlier version of the Qalasaya to the west and a monumental platform to the north. During the subsequent Middle Pukara period the pampa was transformed into a residential area, with evidence of domestic activities, small-scale craft production, and ritual activities in a series of architectural compounds. During the same period the Qalasaya was significantly expanded; the platform mound was reconstructed, and sunken courts were constructed on the uppermost platforms (Wheeler and Mujica 1981). At least two secondary platform mounds were likely constructed to the north and south during this time. Klarich (2005a, 2005b, 2009) has argued that the large-scale transformations of the Qalasaya and Central Pampa reflected a shift from inclusive to exclusive leadership strategies over the course of the Late Formative period at Pukara. At a regional level, during the later part of the Late Formative there is no evidence of another center rivaling Pukara in scale or influence in the northern basin. Unfortunately, the nature of Pukara's collapse remains unclear; evidence indicates that this once-vibrant regional center was abandoned in the early centuries AD and not significantly reoccupied for several centuries.

AN ABUNDANCE OF EXOTICS: LITHIC ASSEMBLAGES AND OBSIDIAN USE

For archaeologists working in the Titicaca Basin, the presence of obsidian necessarily reflects some type of exchange relationship with individuals or networks outside the region, as no high-quality obsidian sources are available locally. There are several obsidian sources along the spine of the western Andean cordillera, but the Alca (Glascock, Speakman, and Burger 2007), Chivay (Burger et al. 1998), and Quispisisa types are the three most widely circulated in Peru and northwestern Bolivia (see figure 7.1) (Tripcevich 2007:182; see also Burger, Chávez, and Chávez 2000). Previous research in the Titicaca Basin has established that 90 percent of the obsidian recovered from prehistoric sites in the region was procured from the Chivay source, which is northwest of Lake Titicaca in the Colca Valley of Arequipa (Burger et al. 1998; Burger, Chávez, and Chávez 2000; in Tripcevich 2010:66). The import of obsidian significantly pre-dates the emergence of regional political

economies; of all non-local traded goods found in pre-Hispanic contexts, obsidian is the earliest identified exotic commodity to enter the basin, appearing in small quantities as early as 8,000 years ago in Middle Archaic occupations at the site of Quelcatani (Aldenderfer 2002). Excavations on the Island of the Sun in the southern Titicaca Basin of Bolivia identified trade in obsidian from as early as the later part of the third millennium BC (Stanish et al. 2002), with nearly all of the materials imported from the Colca Valley.

Geochemical analysis of the obsidian from Pukara and Taraco indicates that nearly 100 percent was imported from the Chivay source, located in the Arequipa area approximately 200 km to the west. A random subsample (n = 58) of obsidian artifacts from Taraco's Formative contexts was selected for geochemical characterization using PXRF. Results indicated that all of the artifacts had been imported from the Chivay source with the exception of one specimen, which was traced to the Alca source (Levine 2012; Levine et al. 2013). A smaller sample was tested from recent excavations at Pukara (n = 15), with all sourced to Chivay (Tripcevich, personal communication, 2014). These results are consistent with a number of other compositional studies of obsidian in the Titicaca region and likely indicate the presence of regular trade routes and relationships that persisted for centuries (Levine et al. 2013).

Although obsidian must have been imported from sources located at a significant distance, it figured prominently in the political economy of the northern Titicaca Basin during the Formative period (Burger, Chávez, and Chávez 2000) and likely had symbolic or ritual value (Tripcevich, Eerkens, and Carpenter 2012). The recent analyses of excavated lithic materials, outlined below, are first used to characterize and quantify the relative abundance of obsidian at Pukara and Taraco. Second, the condition of the lithic debitage recovered from both sites is summarized, providing unique insights into the nature of obsidian processing during the Late Formative. Importantly, independent analyses of both the Taraco and Pukara samples indicate that craftspeople at each of the sites made few efforts to conserve obsidian, reflecting a "cavalier" treatment of an exotic raw material that merits further investigation and explanation.

Pukara

Approximately 1,800 lithic artifacts were analyzed from Early and Middle Pukara period contexts on the Central Pampa (Schultze 2010; figure 7.5), including 15 obsidian samples subjected to geochemical analysis. The visual analysis included all Formative period lithic materials recovered from three excavation blocks, which each measured 5 m × 5 m and reached 1 m to 2 m in depth. The excavated deposits

were characterized by superimposed occupation surfaces with a variety of activity areas, including primary middens associated with food preparation and disposal areas (Klarich 2005a). While the assemblage is an admittedly small sample from the expansive Central Pampa (see figure 7.3), it is the first collection of securely dated lithic materials to be analyzed from Pukara.

The classes of artifacts encountered included tools, stone-working debris (hammerstones, cores, flakes, and shatter), and raw materials. Tools (n = 166), either whole or fragmented, in this assemblage were predominately projectile points, digging-tool blades (azadones), groundstone, polishing stones (pulidores), and expedient flake-cutting tools. In addition, represented in small quantities were battleax blades (machacas), projectile stones (bolas), and burin tools. The majority of the assemblage consisted of stone-working debris, including flakes (n = 961), shatter (n = 641), and core fragments (n = 8). Unmodified materials were also recovered (n = 77). Lithic materials identified were, in order of ubiquity, chert, obsidian, basalt, quartzite, sandstone, rhyolite, possible metal ore, quartz crystal (including geodes), red ochre, a green volcanic, mica, milky quartz, and vesicular basalt. Because of the imprecision of field identification of andesite, basalt, and dacite, no attempt was made to distinguish them at this point. They are all grouped as "basalt," meaning a metavolcanic gray to black stone with or without porphyries. To quantify the relative frequency and stage of production for obsidian in the collection, flakes of all materials were weighed and then measured in two dimensions (length, width), and the presence or absence of cortex was noted. In the single lot with a prohibitively large (>100) number of small flakes, each flake was not measured; rather, they were grouped into size categories of smaller than 0.5 cm, between 0.5–1.0 cm, and larger than 1 cm. The presence or absence of cortex was noted, and the groups were weighed together.

A number of observations provide valuable insights into the organization of production and consumption of lithic materials during the Late Formative period. First, chert and obsidian are the highest-frequency lithic materials in the assemblage. When considering all flakes by count, 53 percent are chert, 33 percent are obsidian, 7 percent are basalt, and 7 percent are "other" (see list above). If we limit the comparison to only chert and obsidian present within the assemblage, 62 percent of the flakes were chert and 38 percent obsidian. While the relative frequencies of chert and obsidian do change over time and also vary across excavation blocks, local and exotic sources appear in relatively even proportions. Second, the obsidian present is unusual in that it is in an early stage of production. Much of the assemblage comprised, or showed remaining evidence of being worked from, oxidized and un-worked tabular obsidian pieces. Some of these rectangular pieces were still present in an un-worked and minimally worked form. Sizable chunks of obsidian

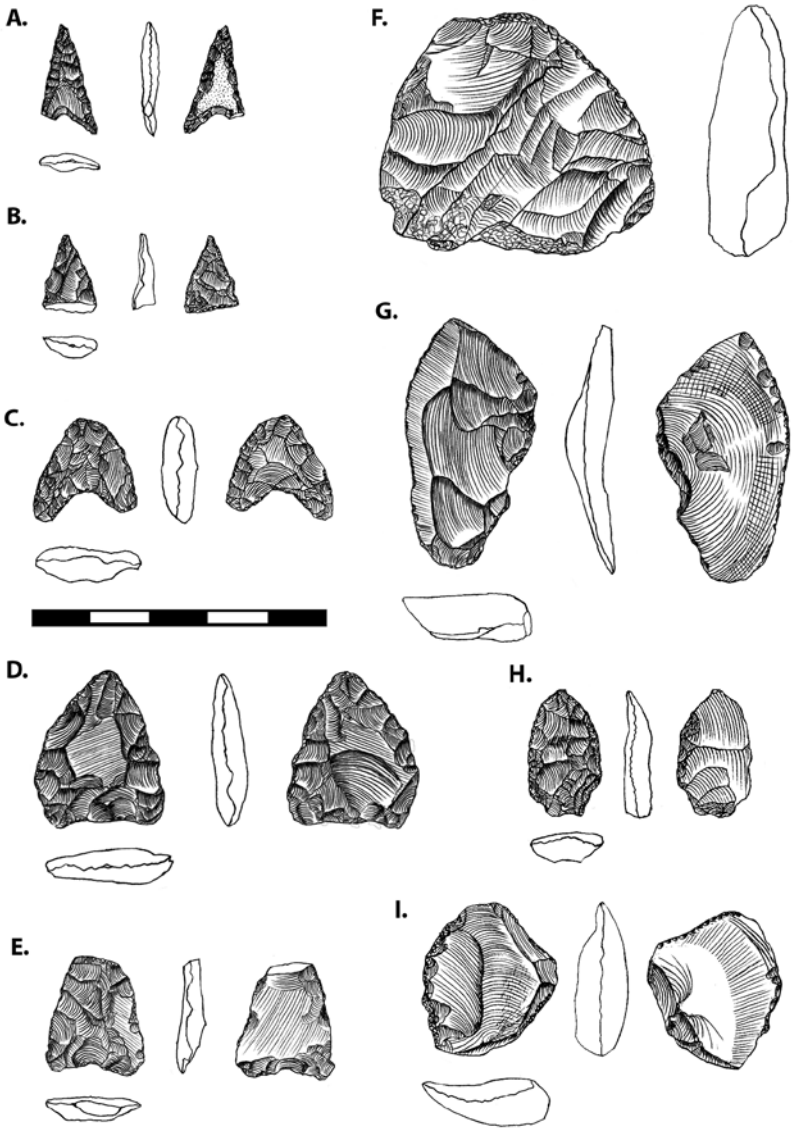

Figure 7.5. Obsidian artifacts from the Central Pampa at Pukara: A. concave base projectile point (Block 1, type 5D, earliest dates 3500–3000 BP); B. projectile point tip (Block 2); C. concave base projectile point (Block 2, type 5C, earliest dates 3500–3000 BP); D. bifacial knife or projectile point (Block 3); E. concave base projectile point (Block 1, type 5D, earliest dates 3500–3000 BP); F. bifacial preform (Block 3); G. expedient flake tool (Block 1); H. unfinished projectile point (Block 2); I. expedient flake tool (Block 1). Classification based on point types from Klink and Aldenderfer 2005.

were abandoned without further effort to rework, recycle, or conserve.

Building from this observation, there is significant evidence for experimentation with different production methods, which results in many half-worked, failed, and otherwise abandoned pressure-flaked, rectangular chunks. There is a distinction to be made between oxidized un-worked surfaces and cortex, as both are present. It appears that obsidian may have been imported in the form of un-worked rectangular or tabular chunks. Craftspeople then seem to have been inexpertly experimenting with pressure flaking these tabular pieces; much of the obsidian was subjected to shallow pressure flaking along the edges. As a result, a large number of failed points were broken during manufacture rather than use. Points were made in an expedient manner by pressure flaking edges of the tabular pieces. In addition to shallow edge flaking on tabular chunks of obsidian, there were whole, broken, and nearly completed projectile points with shallow pressure flaking and un-worked surfaces (including cortex) remaining on one or both faces. Some of the projectile points and point fragments were only unifacially pressure flaked with cortex present on the un-worked face. These were noted in both obsidian and chert but more often on obsidian.

Lastly, also unusual is the use of obsidian for expedient flake tools (unmodified used flakes). These cutting tools are generally made from the most plentiful local stone available; the use of an exotic material for this type of tool is unexpected and indicates that obsidian was treated as if it were plentiful at the site. This somewhat cavalier use indicates that there was no attempt at, or perhaps need for, conservation of obsidian during the Late Formative at Pukara.

Taraco

In Area A, three random quadrants, totaling 36 m^2, were excavated to depths of approximately 4 m or until sterile soil was reached. In addition, two profiles along the river margin, each measuring 35 m in length, were made vertical and cleaned, providing long transects of the mound (Levine et al. 2013). A total of 4,100 lithic artifacts were recovered from these excavations across all occupational phases; obsidian artifacts comprised approximately 20 percent of this general assemblage. The majority of formal and functional categories identified for the Pukara lithic assemblage were present at Taraco (Levine 2012).

Obsidian was present in all occupational phases, and a sample (n = 76) from unmixed Formative contexts was selected for macroscopic visual analysis. Of the artifacts analyzed, only two could be classified as finished bifaces; all others were categorized as debitage or retouched flakes, and no cores were identified in the sample. The total weight of the sample was 155.4 g, indicating a relatively large average size for the flakes and debitage. While this quantity may be paltry in comparison with

some well-known Mesoamerican contexts (e.g., Braswell 2003), it is nearly double the total amount of obsidian found in four seasons of excavation at Chiripa, an analogous center in the southern Titicaca Basin (Bandy 2001, 2005; Hastorf 1999). In addition, the fact that the Chiripa sample was composed primarily of bifaces and only a very small amount of debitage suggests that residents acquired obsidian in the form of finished points (Melson 2010; Perlès, Takaoğlu, and Gratuze 2011; Seddon 1994). Taraco, in contrast, was likely a locus of tool manufacture (Blomster and Glascock 2011) and, in light of the Chiripa data, almost certainly a preliminary node in a large regional exchange network (Renfrew 1975, 1977).

Importantly, analysis of the flaked tools indicated marked shifts in raw material preference over time. While obsidian is present in the earliest occupational phases, the Phase 1 assemblage is characterized by greater use of locally available raw materials for the production of flaked tools. During this time, 71 percent of flaked tools were made from a material other than obsidian—most often chert but also quartz and fine-grained volcanics such as andesite, basalt, and rhyolite (Levine et al. 2013). During subsequent phases, obsidian is imported in ever-increasing quantities, such that by the Early Pukara period (Phase 3) there is a clear preference for this expensive material over equally useful, locally available alternatives ($X^2 = 19.0892$, $p < 0.001$). During this time there is essentially a glut of obsidian, with 82 percent of flaked tools made of this exotic import (Levine 2012).

Following the burn event associated with raiding activity by Pukara, there is a steep drop in both the abundance and the average size of obsidian artifacts, two shifts that indicate a loss of access to the Chivay obsidian source. A statistically significant decline in the mean size of obsidian debitage following the burn event ($p = 0.01168$) suggests conservative manufacturing behaviors consistent with more limited access to resources, as well as the recycling of old materials, which results in smaller artifacts and debitage. The reuse and retouching of artifacts would also indicate new limitations or restrictions on raw material (Stanish and Levine 2011).

DISCUSSION

Based on the recent analysis of two assemblages, it is evident that tool producers at Pukara and Taraco had reliable access to obsidian and were relatively wasteful in their production techniques. As people tend to waste more when resources are abundant, the size of debitage serves as a useful proxy for access to obsidian (see Surovell 2003). The "cavalier" use of obsidian identified in the Formative contexts at both locations is likely linked with, and can indicate, regular and reliable access to the obsidian trade and traders. The ubiquitous nature of obsidian, together with its relatively careless treatment, suggests that it may have been considered an "ordinary"

good (Smith 1999) by the Late Formative.

Our observation of "cavalier crafting" parallels the findings of Tripcevich's (2007, 2010) diachronic studies of obsidian circulation and utilization in the Lake Titicaca Basin. He has argued that while obsidian had served as a status marker during the earliest phases of occupation in the region (Archaic period through the Middle Formative), its meaning shifted by the middle of the Late Formative, approximately AD 1 (Tripcevich 2010). By this point in time, obsidian was widely distributed throughout the northern and western basin (Tripcevich 2010:65). It was also generally available for pastoral populations in the region, as indicated by the presence of Chivay obsidian at rock shelters and herder sites during all time periods (Tripcevich and Contreras 2013). By contrast, small relative frequencies and restriction to elite contexts are features of obsidian distribution for the southern Titicaca Basin (Couture 2003; Giesso 2003).

Tripcevich has also noted that unlike utilitarian goods such as salt, Late Formative period obsidian "continued to have meaning beyond the functional cutting properties of sharp stone" (Tripcevich 2010:66). He suggests that this particular exotic good—primarily used for the production of projectile points—could have signaled regional alliances with source areas, identified ethnic affiliations, or been a component of ritual practice (Tripcevich 2010). In other words, obsidian was a symbolically important good in the Titicaca Basin, but it was not restricted through elite control of trade networks by the Late Formative.

We propose an alternative interpretation for the abundance of obsidian identified during the Late Formative at Pukara and Taraco, which is linked to the importance of signaling abundance at influential centers. In fact, Smith (2012) has argued that the illusion of abundance (whether real or perceived) was a defining characteristic of early central places. An inherent seeking of abundance was a likely factor contributing to the growth and development of urban centers, which came to represent concentrated loci of production and consumption, particularly in nonstate contexts. In the case of obsidian, we consider that the presence and nature of production debris may provide insights outside the realm of technology. Perhaps, as proposed by Smith (this volume), "Like the accumulations of manufactured objects, the heaps and scatters of waste material from production . . . presented a visible record of plenitude forming part of the community's experiential landscape." At Taraco, for example, the intensification of trade in obsidian during the Early Pukara period occurred alongside a number of other important political and economic developments. An increase in the abundance of obsidian found in the residential sector corresponds chronologically with the construction of a large platform in the ceremonial sector of Area A during the first century BC (Levine 2013), as well as increased participation in local exchange networks and supra-household

food-sharing events around the site area as a whole (Levine et al. 2013).

Notably, the site-wide burn event at Taraco in the first century AD was followed by a major loss of economic and political status for site residents. As indicated by a statistically significant decrease in the size of debitage, the previously cavalier crafters became more conservative in their treatment of obsidian, perhaps retouching or reusing debitage and broken artifacts (Stanish and Levine 2011). This major shift in the treatment of obsidian prompts an important question: if obsidian had assumed an ordinary status in households across the northern Titicaca Basin by the turn of the millennium, why did Taraco's political troubles correspond to a decrease in the size of obsidian debitage (and presumably access) in the residential sector?

Parallel developments are evident at Pukara during its initial Late Formative occupations as large-scale food-sharing events were prepared and consumed in the monumental public spaces of the site's civic ceremonial core (Klarich 2005a, 2005b). Excavations on the Central Pampa recovered obsidian from virtually every Late Formative context, with chert and obsidian artifacts present in similar frequencies per context. However, obsidian is found in higher numbers than chert in the initial occupation of Block 3, an outdoor activity area with multiple hearths and primary bone middens likely used for the preparation of supra-household meals (see Warwick 2012). Future research will explore the possible relationships between obsidian artifacts and feasting activities, important public events linked to early leadership strategies at Pukara.

There are many benefits to an abundance perspective when framing the lithic data from Pukara and Taraco, but it is also important to acknowledge the lacuna in comparable regional data sets as a limiting factor at present. Based on our excavations, these northern basin centers had consistent access to obsidian and, in fact, a relative abundance of this exotic good when compared with contemporaneous centers in the southern basin, such as Chiripa and Kala Uyuni (Bandy 2001, 2005; Bandy and Hastorf 2007; Hastorf 1999), and even neighboring sites in the northern basin (Cohen 2010; Plourde 2006; Zegarra 2014). Considering the distance of the southern basin centers from these sources—Chivay is approximately 350 km to the northwest (Bandy 2005:95)—some of these differences are expected. What remains to be established is a broader pattern of obsidian artifact production and consumption at contemporaneous northern basin sites, particularly small villages and hamlets, that would have interacted with both Taraco and Pukara (Stanish 2003). Recent publications of field research at the Formative period sites of Huatacoa (Cohen 2010), Balsaspata (Tantaleán 2012), and Cachichupa (Plourde 2006, 2012) have all noted the presence of obsidian in excavated contexts, but detailed quantitative and qualitative descriptions of the lithic assemblages needed

for comparative analyses are not readily available (cf. Schultze 2008).

The current study does, however, build upon research initiated well over a decade ago by Burger, Chávez, and Chávez (2000) in their regional study of prehistoric obsidian procurement and exchange in the Central Andes. While their primary focus was to document shifting circulation networks for Chivay and Alca obsidian, they also provided descriptions of obsidian recovered from many of the 160 sites included in the analysis. Obsidian artifacts from a number of Middle and Late Formative Titicaca Basin sites were included in their regional survey, including surface remains and excavated objects from Taraco, Pukara, and Qaluyu. Qaluyu, a mound site 4 km north of Pukara, provides preliminary insights into Middle Formative obsidian use, showing a characteristic pattern associated with the conservation of a scarce resource. The early occupations of Qaluyu are characterized by tools made of very small flakes—"no large cores or preforms, nor even large chunks of obsidian, are known to occur at the time" (Burger, Chávez, and Chávez 2000:296)—that reflect on-site manufacturing and retouching. Tools were made of very small flakes, the kind that would typically be discarded. Burger and colleagues interpret this as evidence that obsidian was a rare material being maximized through conservative production techniques. More recently, excavated lithic assemblages from sites in Puno Bay, located on the western shores of the lake, also reflect conservation of obsidian as a precious resource in Formative contexts (Schultze 2008). At Huajje, for example, the only obsidian artifacts recorded were projectiles that had been sharpened into micropoints.

A different pattern was identified at Taraco and Pukara in occupations that slightly postdate those documented at Qaluyu. Burger, Chávez, and Chávez (2000:322) note "large pieces" from the pre-Pukara levels at Taraco from the more distant Alca source. In the subsequent Pukara levels, "Slightly larger, thick chunks are more abundant, many with cortex still remaining," from the Chivay source (Burger, Chávez, and Chávez 2000:322). They note a similar pattern—the use of larger pieces of obsidian—in their analysis of Formative period obsidian artifacts excavated by Kidder at Pukara in 1939. While the inhabitants of all three Formative period sites were using exotic lithic raw materials, these earlier studies first suggested that Taraco and Pukara had access to larger pieces of obsidian while knappers at Qaluyu relied on very small flakes for tool production. These same general patterns have been identified from our recent analyses, which document the discard of large, minimally worked obsidian flakes at both Pukara and Taraco.

CONCLUSION

The proposal that waste may function as both a marker of status and a proxy for

access is compelling and ties theoretically to other well-documented practices such as potlatching, in which prestige is directly correlated with how much one can give away or destroy. In these cases, it is the elimination of abundance rather than its possession or display that confers prestige. In the words of Smith (2011), "I discard, therefore I am." Under these conditions, the ability to waste becomes an important signifier of political and economic status, falling under the parallel umbrellas of conspicuous consumption and costly signaling. Cavalier treatment of imported exotics is an effective advertisement, functioning as a proxy for the strength of trade relationships and of residents' access to coveted resources.

Under different circumstances, residents of Taraco and Pukara might have opted to use their resources to produce the maximum number of artifacts. These artifacts could have been used for trade, display, or myriad other aggrandizing behaviors, and in many cases they were. However, the consistent wasting of large amounts of these resources suggests that the public discard of obsidian was likely as important as—and in some cases may have superseded—other potential uses in terms of ideological utility. Clearly, the value of obsidian was highly dependent on the time and place in which it was exploited (e.g., Levine and Carballo 2014). In light of these new data from two major regional centers in the Lake Titicaca Basin, we advocate the importance of examining patterns of use for exotic materials in archaeological context, not just simply identifying that these goods existed in relative abundance.

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NOTES

1. "Upper" and "Late" Formative are used interchangeably in the northern Lake Titicaca Basin. To maintain internal consistency, we use "Late" throughout this chapter.

2. The fifteen radiocarbon samples from the 2001 excavations range from 360 BC–AD 230, with eleven falling within the Middle/Classic Pukara period range (200 BC–AD 100),

two with large ranges that span the Initial Pukara (500–200 BC) and Middle/Classic periods, and two that span the Middle and Late Pukara (AD 100–300) periods (Klarich 2005a; see also Mujica 1988).

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