

From Herders to Wage Laborers and Back Again: Engaging with Capitalism in the Atacama Puna Region of Northern Chile

Flora Vilches¹ · Héctor Morales¹

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Abstract Towards the end of the nineteenth century, indigenous Atacameño society transited from an agro-pastoralist to a more diversified capitalist-based economy due to a growing mining industry in northern Chile. The puna herders engaged in the new capitalist order as wage laborers in sulfur mines and llareta (*Azorella compacta*) exploitation companies. In this article we show how indigenous knowledge acted as cultural capital that enabled the herders to work as laborers. This operation led to horizontal treatment among the different agents in the taskscape that those “herder-laborers” inhabited, including those incorporated by industrial capitalism.

Keywords Atacama Puna · Herders · Mining · Capitalism · Chile

Introduction

In the late nineteenth century, the subsistence mode of Atacama indigenous societies shifted from an agro-pastoralist economy to a more diversified capitalist one (Gundermann 2004; Núñez 2007; Sanhueza and Gundermann 2007; Vilches et al. 2014a, b), a transformation that resulted from the expansion of the mining industry in Northern Chile in the context of a national modernization project that ushered the country fully into the industrial age. This process occurred in tandem with the War of the Pacific (1879–83), a conflict that resulted with a Chilean victory and the

✉ Flora Vilches
floravilches@gmail.com

Héctor Morales
hemorales@uchile.cl

¹ Department of Anthropology, Universidad de Chile, Av. Ignacio Carrera Pinto, 1045 Santiago, Chile

incorporation of a large part of the Atacama Desert, formerly held by Peru and Bolivia, into its national territory. This modern-capitalist project sought to take advantage of Chile's progress, economic success and increased efficiency to insert the country into the global context, on a par with its counterparts in the Northern Hemisphere. As part of that process, major mining centers began to appear in the Atacama Desert, first for nitrate and then for copper, bringing with them a variety of new technologies such as extensive railway networks, European-inspired architecture, and telecommunications systems, among other things (Garcés 1999). The mining camps attracted a growing workforce from around the country, including workers from the local indigenous population (González 2002).

While some indigenous people stayed in their traditional territories—notably the herders of the Andean Puna (highlands)—they did not remain outside of the new capitalist order. In effect, industrialization also spread to the Atacama Puna through sulfur mining and llareta (*Azorella compacta*) extraction, which acted as subsidiary industries to large-scale nitrate and copper mining. While sulfur was used to process other minerals, llareta served as fuel for industrial operations, but above all was used as a heat source for the mining camps. The Puna herders, for their part, were hired as wage laborers in the sulfur mines and llareta extraction enterprises in the highlands of Northern Chile (above 3500 m a.s.l.), intensifying their long-established links to those resources, which were based on small-scale consumption. Only after the War of the Pacific, when the Atacama came under the purview of the Chilean state, did a market for indigenous economies emerge in the Puna (Yáñez and Molina 2008).

In this article, we use historical archaeology to explore how capitalist industrialization became linked to the pastoral way of life of the herders of the Atacama Puna. Our investigation examines a group of sulfur and llareta extraction operations in the southern part of the Atacama Puna, near the Atacama Salt Flat, focusing specifically on two sulfur camps and two llareta extraction operations. The former are the SACIEL and Ojo de Toro mines, situated near the Puna towns of Machuca and Guatin, respectively, just 50 km from the oasis of San Pedro de Atacama, lower down on the salt flat. The llareta extraction systems we focus on—Gutiérrez 1 and 2—were situated close to these mines, and included an extensive network of roads and shelters (Fig. 1). Survey, site recording and oral history alongside historical analyses were conducted on each of these sites. Site recording included the surface collection of material remains.

Through an analysis of the architecture and certain objects deposited there, we propose that, despite not having a pre-existing close link with the large-scale extraction of sulfur and llareta, the Puna herders engaged with these industries, incorporating them into their taskscape (Ingold 1993) on their own terms. By exploring part of the materiality that survived the industrial conquest of the Puna, we can gain greater understanding of how the herders conceived of and constructed that new modern world and, in turn, how the new capitalist rhythm shaped that experience. This analysis is based on the notion of material habitus (Meskell 2005), which refers to the lifeworld as an entity that combines persons (human and non-human), objects, deities and all other sorts of immaterial things that cannot be easily delimited, especially by rational taxonomies. Nevertheless, we wish to give special attention to certain objects that the industrial era made readily available and widely circulated, making them seem especially trivial and transparent (Miller 1998, 2007), making them seem the same everywhere, regardless of their context. But the notion of habitus (sensu Bourdieu 1979) alerts us to

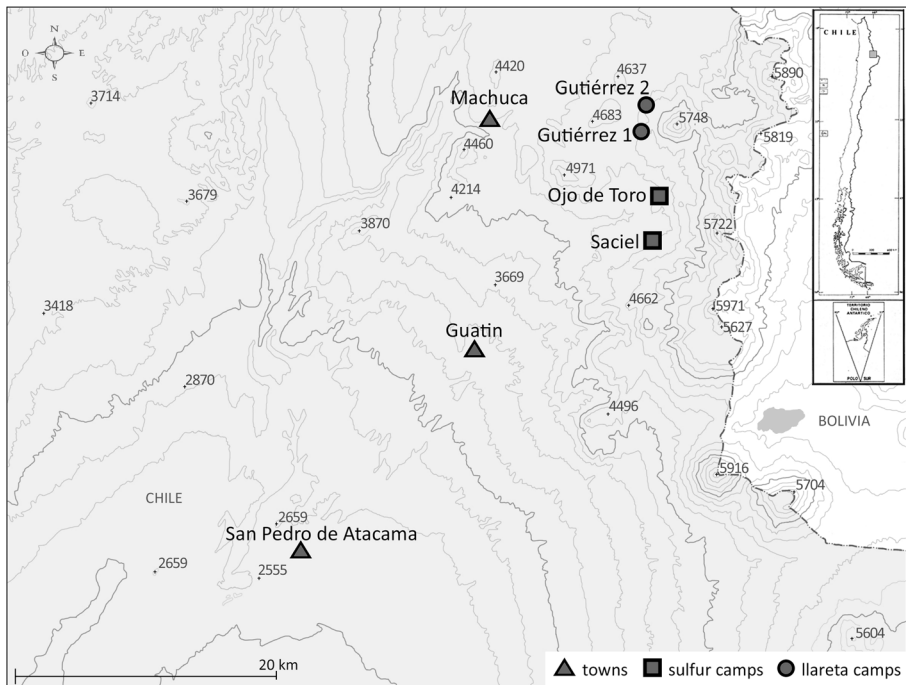


Fig. 1 Map of the study area

the fact that those objects—and indeed the entire material world that surrounds us—act as adequate “frameworks” for action, although they often go unnoticed, and as such they can only be understood within their specific historic and temporal context.

Temporality of the Pastoral Landscape

As anthropologist Tim Ingold affirms, the way in which herder groups lived was not attributable to their cosmovision, cultural tradition or folklore, but rather to their human condition of being immersed from the start, like other creatures, in an active, practical and perceptual engagement with constituents of the dwelt-in world (Ingold 2000a, b). Together this forms a taskscape (Ingold 1993)—an array of interrelated activities—that in the case of the Atacama Puna revolves around camelid herding or transhumance in a particular temporality.

Herding in the Atacama Puna (Space, Social Organization and Beliefs)

Based on the archaeological and ethnographic record, we know that herding in the Atacama Puna was expressed in a series of spatial, social and symbolic relations embedded in a particular ecology (see e.g., Cartajena et al. 2007; Grebe and Hidalgo 1988; Morales 1997; Núñez et al. 2006). An element of that expression, therefore, is the deployment of specific knowledge that enabled the herders to live in the unique environment of the Puna, where the altitude leads to a large daytime-nighttime

temperature variation and intense solar radiation, and water is scarce. Because of this, inhabiting the Puna requires detailed knowledge not only of altitude differences, the microclimates available in the water basins, and the quality and magnitude of grasslands for forage, but also the ethological behavior of the camelids in the zone (Fig. 2). As a matter of fact, the movement of herders and animals fluctuates in direct relation to the increase or decrease in available forage, which regulates herding activities and transhumance in general, both seasonal circuits (in a vertical sense) and daily ones (in a horizontal one). These strategic movements are related to the concept of archipelago proposed by Murra (1975), which refers to the complementarity of different ecological niches in the context of permanent transhumance. In that context, dwelling-in-the-Puna is nothing other than the Puna inhabitants' engagement with the flow of biotic and abiotic energies in the high altitude environment (Thomas 1977).

In turn, these circuits of transhumance are associated with road networks containing a series of scattered constructions arranged according to technical-environmental requirements for optimizing the use of natural resources. And so the way in which the herders managed the Puna space is also reflected in the techniques they used to build dwellings, corrals and other herding-related structures, which vary in complexity depending on the type of circuit of which they are a part (Göbel 2002). It is worth noting that both the roads and their associated infrastructure are part of an organizational model that regulates social relations among herders (Flores Ochoa 1981), and in the Atacama Puna that organization is based upon kinship, with each family having its own grasslands that are recognized as such by the others not on the basis of property deeds, but on the basis of ancient custom (Morales 1997).

It is evident, then, that the pastoral way of life requires herders to possess in-depth knowledge of their environment and the productive activities carried out therein, and all of that is founded, in turn, upon a body of religious beliefs and expressions linked to camelids (particularly llamas), mountains, water and grasslands. Moreover, when materialized in magical techniques, these beliefs allow the balancing of human and non-human forces, producing a certain attitude toward nature. It is this body of beliefs of the herding community that enabled its members to engage in a whole series of activities and justify them with their own moral and social rationale (Castro 2000). In that context, the ceremonies that express those beliefs are understood as actions or acts



Fig. 2 Puna of Atacama environment

formulated by custom to worship divine entities and give thanks. Especially notable among the Andean deities or spirits that are venerated by the herders are the mountains, the land and the ancestors. Indeed, the mountain spirits are central to pastoral life, based on the belief they are the source of water and forage for their animals (Castro and Varela 1992). The community acknowledges these benefits with gifts or “payments” in the form of alcohol and coca leaves (*Erythroxylum-coca*), in an ongoing cycle of reciprocity that keeps the deities and the community in balance (Grebe and Hidalgo 1988).

Returning to Ingold, then, we could say that the pastoral way of life has at its disposal a set of technical devices for and knowledge of the environment. In addition, however, the herders’ productive activities are underpinned by a series of religious beliefs and expressions related to camelids, mountains, rivers and grasslands that are part of a cultural context in which the balance of supernatural, natural (non-human) and human forces is of fundamental importance. All of the above is assembled in a temporal and spatial mobility that ultimately enables the herders’ dwelling in the Puna. We could say that in this assemblage of social, spatial and symbolic relations the herders form a certain temporality that transforms the Puna into what Ingold (1993) would describe as a taskscape, the world in which the herders dwell in engagement with its other constituent beings.

A New Era Dawns: Capitalism and the Mining Industry in the Puna

Since European contact, a series of social, economic and political processes have affected the Puna, particularly in regard to land use and ownership. Here we will center on the emergence of sulfur mining and llareta extraction over the past century.

Documentary information on the Atacama (from the Loa Property Registry) indicates that sulfur mining “claims” were registered in the Puna between 1925 and 1981. When duly registered, mining claims allowed the extraction of a specific resource and were granted to both private individuals and legal entities upon payment of a fee (Sanhueza 2015). Most of these claims were registered by non-indigenous business owners, whether *criollos* (locally-born of European descent) or European immigrants. This ownership structure extended to other Andean spaces in the twentieth century. Sendón (2009), for example, describes how the policies implemented by the Peruvian state to incorporate the indigenous-peasant population into a single national territory, did nothing but fragment a social space of intersecting mobile groups. Nevertheless, the territorial problems and the herders’ relationship with the mining industry date back further, to colonial times when, as Gil Montero (2009, and see this volume) indicates, the Spanish conquistadors recognized the mining potential of the Andes—especially Potosí, in the Bolivian highlands—and the herders’ indispensability to that economy. They had longstanding knowledge of techniques that enabled them to mine deposits and to transport ore and supplies over long distances, and deployed these as part of their tribute to the Crown.

In the Atacama Puna, the industrial-scale production of sulfur that began around 1880 was unprecedented (Machiavello 1935), with hardly any evidence of even small-scale operations of this kind in the past (Garrido 2015; Yáñez and Molina 2008). We know that the Bolivian state was expropriating indigenous communal lands in the time before the war, promoting their division and privatization (Barros 2008; Yáñez and Molina 2008). Once the Atacameño lands became part of the Chilean state, in 1884

(Sanhueza 2001), “communal stewardship became more prevalent once more for traditional grazing, hunting and gathering lands, with the only difference being that those lands were now owned by the Chilean government” (Yáñez and Molina 2008, p.58). The fact that there were sulfur claims registered in 1925 and following, therefore, indicates that at least a significant portion of the Puna was privatized for the purpose of mining development by non-indigenous business owners.

Still, the capitalist conquest of the Puna was a gradual process. In his economic study of the sulfur industry in Chile, Machiavello (1935) categorically affirms that the cost of producing Chilean sulfur was so high at that time that the product was difficult to sell on the global market, and so virtually all of it was destined for domestic consumption. Machiavello identifies three main difficulties facing sulfur operations in the North—the human factor, transportation, and heavy snowfall (1935). The common denominator among the three is the altitude, as it reduced worker productivity (due to the cold and lack of oxygen), required the use of mules (which were stronger than llamas but had a lower carrying capacity due to poor adaptation to highlands) instead of llamas, and led to work stoppages due to the harsh climate. While the transportation network seemed to be improving, especially because since the introduction of the railway and trucks, the other two factors had only one solution: “the Bolivian Indians raised under these conditions were the only ones who could manage to work in [the mines] *although they are less productive*, [Bolivian and Peruvian Indians] are not affected by the altitude” (Machiavello 1935, p. 11, emphasis added).

Machiavello’s estimation of the indigenous inhabitants of the Puna is not far from the discourse of marginality and extreme poverty surrounding these groups since colonial times (Sanhueza 2001). And it is also colored by a nationalist perspective that separates the indigenous people of the Puna—exclusively Bolivians and Peruvians—from Chilean workers (who were less resilient but *more productive*). In fact, Machiavello’s perspective recalls the words of Atacama parish priest Emilio Vaisse, who in the late nineteenth century referred to the inhabitants of the Puna as peoples who “shared the generalized apathy of the Indian race” and had therefore not developed more diverse crops, but were happy with the naturally abundant grasslands (Vaisse 1898 in Sanhueza 2001, p. 65). As Sanhueza (2001) affirms, documents of that period often identified the local inhabitants as “primitive” and “poor,” comparing them unfavorably with their counterparts in the Atacama lowlands. The latter—the indigenous inhabitants of the Salt Flat—were more capable of being “civilized” as they did not have to deal with the “hostile” environment and its low agricultural potential. Nevertheless, in the 1930s, despite his estimation of the Puna inhabitants as marginal and apathetic, Machiavello recognizes their ability to withstand their hostile environment as a virtue. They were the only ones capable of advancing the sulfur mining industry as well as the llareta industry. While there is no evidence of concessions granted for the latter operations, we know that it was extracted in conjunction with sulfur, to a great extent because llareta grows on the slopes of sulfur-bearing volcanoes.

Ethnographic records indicate that prior to its large-scale extraction, llareta was used by the Atacameño people as fuel for cooking and heating, as well as medicinally (Garrido 2016). At the industrial level, it was used as fuel in sulfur and borax camps (e.g., Borax Consolidated Limited), as well as copper camps (Chile Exploration Co., also known as Chuquicamata) to heat the ore-processing forges, although mostly it was used to heat the dwellings of mine workers (Urdangarin 2007). Like sulfur mining,

llareta extraction by inhabitants of the Atacama Puna occurred around the volcanoes lying north of the Salt Flat, from the Santa Rosa de Ollagüe Volcano in the North to Licancabur Volcano in the South. Herders from villages such as Río Grande, Machuca and Guatin worked in the sulfur mines nearest the Atacama Salt Flat and for the llareta extraction companies that operated nearby. However, many of them later moved to Ollagüe in search of better working conditions (Garrido 2015).

Still, Machiavello's early analysis of the sulfur industry was not entirely mistaken. While the industry never took off with the same force of the nitrate or copper industries, it did manage to establish itself in the Atacama Puna for a couple of decades before dwindling because of competition from the international market. The industry first suffered a major setback in the 1970s, when their biggest customer, Chuquicamata mine, made the switch to synthetic sulfur; then in 1993 it was completely paralyzed by the price and quality of imported sulfur. The llareta industry, for its part, was even more short-lived, as over-extraction led to its virtual extinction in the mid-1950s. Despite its short-lifespan, however, industrial capitalism in the Atacama Puna ushered in new rhythms of interaction for the Puna herders. In that context, as Machiavello comments, in capitalist eyes dwelling-in-the-Puna quickly became a good with functional value for industrial development. The workforce of herders acquired a use value, in the sense that, as natives of the Puna, they were more able to obtain employment as wage laborers, and took advantage of that opportunity to expand their economic horizons.

The New Material-Industrial World

Today, the Atacama Puna is dotted with the ruins of industrial mining infrastructure, much of which is partially dismantled, that bears witness to the passage of modern extractive mining through the region. Given that the Puna is transformed into a commodity for capitalist business owners, we find it useful to explore the contours of that experience from the heart of material life—its material habitus. Both the architecture associated with the new industries and the objects circulating in relation to them, suggest the ways in which—or the degree to which—the new capitalist rhythm came to be part of the temporality of the herders' landscape.

The Built Environment

Despite being separated by a mere ten kilometers, the sulfur camps of SACIEL (Acronym for Sociedad Azufrera Compañía IFMIA [Instituto Minero de Antofagasta] y Escalante Ltda.) and Ojo de Toro are different in both form and function, but they are both variations on the *ex novo* pattern (Garcés 2003) typical of European and US mining industry settlements, in that their configuration and design are directly linked to the resource being extracted. This is evident in the fact that none of these settlements were built near water sources—adding yet another logistical challenge to the industries, which had to provide themselves with water by trucks from the lowlands and/or build pipes close to water sources—, which differentiates them fundamentally from the settlements maintained by herders in the area. As we mentioned above, the herders' circuits, and especially their residences, are situated close to the grasslands that provide food for their livestock, and so water is crucial. Not surprisingly, at 4400 m above sea

level, both SACIEL and Ojo de Toro stand out in their respective landscapes as the only built up area for several kilometers around, and show no signs of having been used by herders after their closure.

SACIEL: A Capitalist Emblem

The SACIEL sulfur mine is the largest in the locality, and its ruins recall a classic industrial mining facility, although strictly speaking it is much smaller than the region's nitrate mines, or even the sulfur mines in Ollagüe (e.g., Amincha, Buenaventura, etc.). Nevertheless, in the usual style of these kinds of installations (Garcés 2003), the residential sector—or, more correctly, the workers' camp—is situated beside the industrial works. The proximity of the two sectors is a typical feature of industrial mining camps, as it was intended to maximize worker productivity by cutting down the distance between home and work, through control systems. The mine itself, in contrast, is further away, in this case six kilometers distant and close to 1000 m higher up, very near the Bolivian border (Fig. 3).

Looking at the residential sector of SACIEL, we can see that it closely follows the imported industrial architectural pattern. It consists of three residential blocks oriented east to west, two of them separated by what could be considered a “street,” the third further removed, leaving a wide open area in the middle. In design, the residential blocks are variations on the basic types found in the nitrate “offices”—shared residences for unmarried workers, houses for married ones—but all in the same standard style (Garcés 1999). At SACIEL, a block with rooms for single workers faces another with houses for families. The former consists of single rooms with doors opening to the outside, while the latter consists of two-room houses with an attached exterior yard. The further removed block differs from the two others, with rooms on both sides that

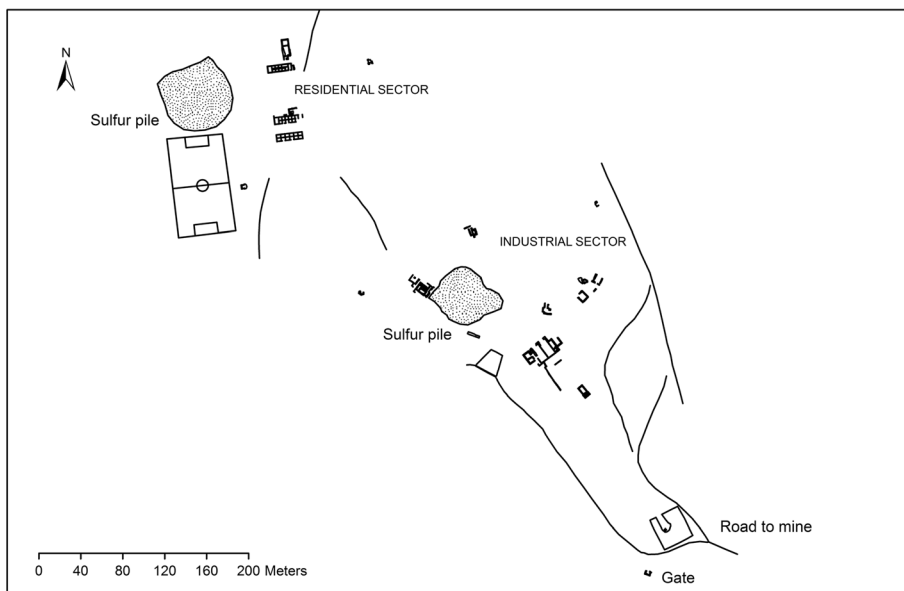


Fig. 3 Sulfur camp SACIEL plan

are accessed from a central hallway, as well as a larger space at one end. The different design and siting of this block suggests that it was occupied by the mine administrators. This organization of the space makes sense, as the two workers blocks were effectively “trapped” (and controlled) between the administrator’s block and the industrial-productive sector. This arrangement is complemented by a soccer pitch, which would have been the only space for collective recreation and was situated strategically in front of the residential sector but flanked by a sulfur stockpile area.

The building materials used at SACIEL also show their similarity with the foreign industrial architectural pattern. All of the residential blocks have cement walls, although these are clad with slabs of worked local stone (ignimbrite) on the exterior and white or colored (green or yellow) plaster inside (Fig. 4). Doors and windows show the marks of wooden frames, while the floors are of stone slabs mortared with cement, or plain cement. Of all these technical-structural features, the stone cladding on the residential blocks is the only feature that evokes the traditional residential style of Puna *estancias* (ranches), in which both the configuration and building techniques are indicative of pre-Hispanic styles (e.g., Núñez 2007), i.e., they were built of cut or uncut stone joined together with mortar. The stones themselves came from quarries near the settlements, while the clay used to join them was collected in quantities sufficient for collective use.

Given that the natural stones are low-cost thermal insulators, we believe that the cladding of the SACIEL residences was an “add-on” intended to alleviate the harsh climatic conditions, taking a lesson from local vernacular architecture. It is likely that those who supplied the stone and built these structures were herders hired by the company (the same people who were employed as workers in the sulfur mines) who made their technical knowledge available to the mine owner and inscribed it onto the canonical model of the industrial mining camp to ensure it would bear up under the extreme climate. While what prevails at SACIEL is an industrial concept of built space, the interior walls of the residences bear the marks of nails, screws, wires and holes of different sizes, as well as wooden sticks, which reflects their use over a period of time but also alludes to the herders’ *estancias*, which over time were equipped to improve them and express the occupants’ identity. It can be assumed that these improvements to the mining camp residences complemented the standard facilities provided by the company, allowing the local workers to live more in the style to which they were accustomed.



Fig. 4 Residential block, SACIEL camp

Despite the retrofitting and improvements that local workers were able to make at SACIEL, the camp remains a reflection of the implantation of an industrial model that imposes a rhythm of work and productivity upheld by continuous surveillance. This capitalist logic reminds us of the words of priest Emilio Vaisse by the end of the nineteenth century—which in turn are based on the colonial discourse—who considered “the concept of the urban model as the only ‘civilized’ way of populating a territory” (Sanhueza 2001, p. 65). SACIEL, in that regard, is an attempt to “civilize” the Puna by organizing its workers. The camp’s spatial arrangement and architecture work together to annul all traces of indigenous culture of the workers, reducing them to wage laborers alone. All of them lived in residential units that were exactly the same, worked equivalent shifts, and received the same salary according to the role they performed. But let us not forget that it is that “poor, apathetic and uncivilized highland inhabitant” that must be corrected/annulled/erased, who at the same time allows the industry to function at all. No worker can withstand the high altitude work as well as the Puna herder. In this sense, the capitalist logic reproduces the ambivalence of the colonial discourse (Bhabha 1994).

Ojo de Toro: Gone Wild(er)

In recent oral accounts this sulfur camp is called “Ojo de Toro” or, less commonly, “Curiquenca” (Garrido 2015). In the Registry of Mining Concessions maintained by SERNAGEOMIN (Servicio Nacional de Minería), the “Curiquenca” claim appears registered to Mr. Juan Ivanovic Yutronic and its location coincides with the location of the camp. We chose however to keep the name given to it by former workers. Despite its proximity to SACIEL, the Ojo de Toro mining camp is quite different. First of all, it only consists of a residential component, which means that the sulfur ore would have had to be transported in its raw state to a processing plant elsewhere. The camp has two areas that are clearly differentiated in terms of form and function, with a few meters between them, and we have called these camps A and B (Fig. 5).

Camp A has a group of four structures, three of them subdivided into a series of windowless rooms accessed by doors from outside, following the “block” logic of SACIEL, although these ones are not uniform and are considerably smaller (Fig. 6, upper). Materials found inside these rooms indicate that they were used for different domestic purposes. These include cookstoves made from steel drums, a raised earth bed outlined with stones, and attachments on the walls that served as shelves, along with nails and pegs in the walls themselves (Fig. 6, lower). We wish to draw attention to the bed, as it contrasts to those at SACIEL, which are all moveable, although other adaptations to the herder’s customary way of life been recorded. The bed in Camp A, however, is the result of a structural decision that is coherent with a construction style more in line with indigenous than industrial architecture. The walls, in fact, are made of locally-sourced stone cut on both sides and mortared. The floor is rammed earth, except in one instance where it is made of stone slabs, as at SACIEL. Also in this camp are three more unmortared (dry stone) enclosures made of uncut rock as well. Although their function is unclear, these structures are similar to the attached enclosures used as corrals in herder *estancias*. In addition to these is a stone oven in the uppermost part of the camp. Overall, the dwellings of Camp A are quite similar to the building pattern found in a primary *estancia* or group of *estancias* (Fig. 7).

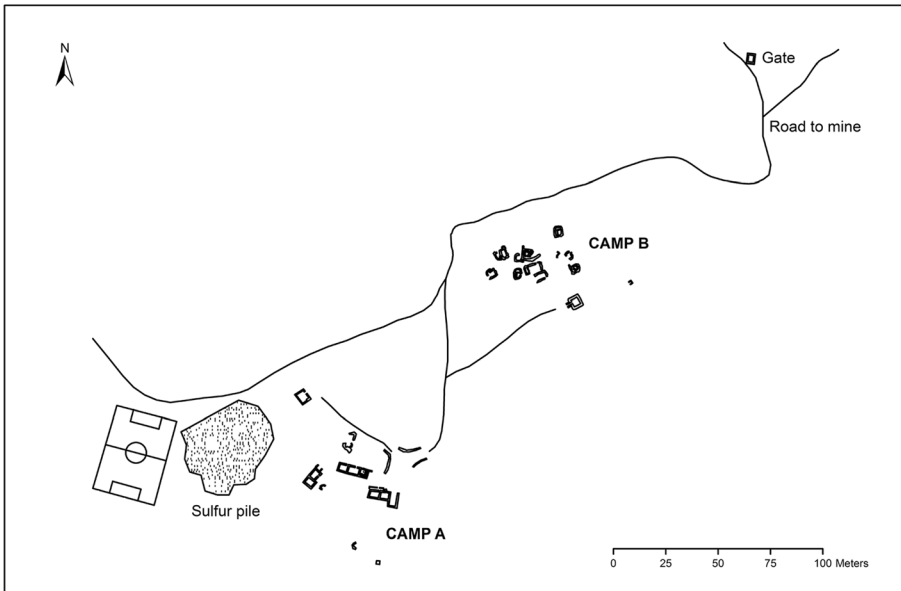


Fig. 5 Sulfur camp Ojo de Toro: Camp A (*left*) and Camp B (*right*)



Fig. 6 Residential unit, Ojo de Toro, Camp A. External view (*upper*) and interior view (*lower*)

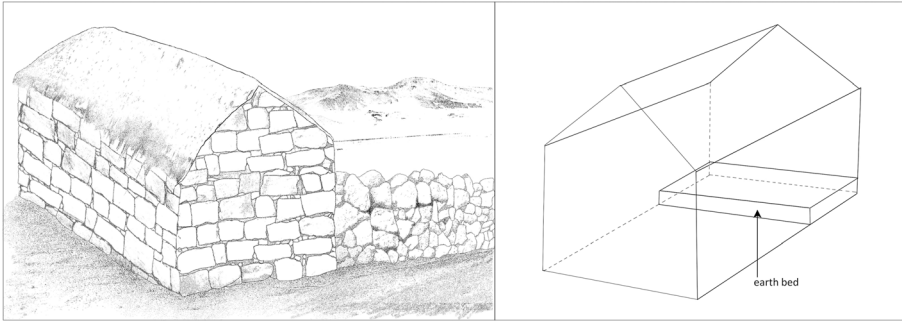


Fig. 7 Herders' *estancia* (ranch)

As mentioned above, this camp is not associated with an industrial operation; the only elements related to ore extraction are a sulfur stockpile and an associated stone structure that was probably used by mine workers to oversee loading and unloading for the stockpile. Both of these elements face the residential sector and are beside the soccer pitch that would have been used as a collective recreational space.

Camp B, for its part, is situated just a few meters East of Camp A. According to the account of one former miner, this camp was built by the workers themselves as a shelter to stay in while they built the road to the mine, about six kilometers uphill from the site. Its construction is completely different from that of Camp A, and could be mistaken for a herder's secondary *estancia* or even a temporary shelter (Fig. 8). These sub-rectangular and subcircular enclosures vary in size and were built of uncut and unmortared stone. Some of the enclosures are joined together, others are set apart; several have single or double-sized raised earth beds outlined with stones. The floor of these enclosures is of rammed earth and it is unclear whether or not they all had roofs.

We assume that Camp B was built before Camp A, as only once the mine was accessible by vehicle could it have entered into operation, and only then would the workers have occupied Camp A. While both camps display a Puna architectural logic, Camp A shows more care and planning in its construction, probably because it was intended for more permanent use. It is possible that the same workers that built (and lived in) Camp B, later constructed (and then lived in) Camp A, although in the latter



Fig. 8 Residential unit, Ojo de Toro, Camp B

case with more input from the company in regard to its organization. Throughout both camps, one sees evidence of how the workers made use of their specific knowledge of the Puna environment during construction. Overall, the number of people this camp could hold is much lower and less well defined than in the SACIEL camp.

Gutiérrez 1 and Gutiérrez 2: Herders at Heart

The llareta camps Gutiérrez 1 and 2 are located a few kilometers northeast of Ojo de Toro and are part of an extensive network of similar settlements that extends from Ollagüe in the North to Guatín in the South. A former worker identified them as belonging to a Mr. Martín Gutiérrez, hence the name; Gutiérrez was an intermediary appointed by the owners. The two camps share some characteristics in regard to the form and size of their enclosures, as well as the construction techniques and raw materials used for the walls, all of which are features of the local indigenous architecture. Indeed, the only major difference between the two camps is their size, which tells us that the number of people who used them as a base for their work would have been quite different (Fig. 9).

Gutiérrez 1 consists of a group of four subcircular or subrectangular structures with uncut and unmortared rock walls and sand floors. Two of them have raised earth beds outlined in stones, indicating their residential nature. The other two seem to be linked to collective food preparation. In fact, beside one of them there is an oven—also made of stone—as well as remains of a firepit and a pile of llareta that was probably used for heating and/or cooking food, indicating that a family may have been the work unit here.

Some 2 km north of Gutiérrez 1 is Gutiérrez 2, which is considerably larger, a sort of enlarged version of Gutiérrez 1, with a total of 21 structures. It does not seem to have spaces designated for specific tasks, as the structures are distributed

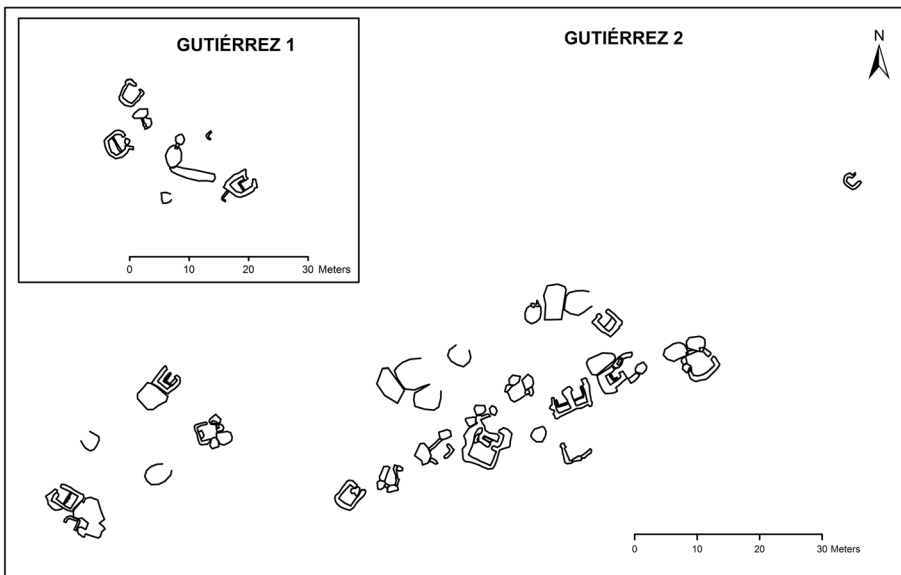


Fig. 9 Llareta camps Gutiérrez 1 and Gutiérrez 2 plans

uniformly around the site and there are no enclosures whose building quality or features suggest a different function. Unlike Gutiérrez 1, some of these structures show evidence of having had pitched roofs, although those roofs are no longer present. Thus, the size of the camp, the details of its construction and the specific activity areas suggest that it was occupied on a more permanent basis—or at least more intensively than Gutiérrez 1—and housed more occupants.

The similarity between Gutiérrez 1 and 2, and Ojo de Toro Camp B is notable. As the latter is a temporary camp that was occupied while the mining installations were being set up, it was constructed by the workers themselves. This, as mentioned, is expressed in its similarity with secondary *estancias* or even transitory shelters. This is repeated in the llareta camps, where by all indications the dynamic of llareta extraction relied fully upon the workers. In effect, llareta extraction was based upon an intricate road network that provided access to the plants, and thus the construction of camps was just one part of the process. But the entire process was the result of the deployment of the specialized knowledge of the workers, who were merely reproducing and magnifying herding practices. Furthermore, the location of the roads and camps depended upon the location of the llareta, with the workers moving around seasonally just as the herders did with their llamas, although with the knowledge that that temporality was not replicable, as once the llareta was extracted it would take hundreds of years to grow back. In that regard, we could say that the llareta workers reproduced the mobility pattern inherent to the camelid herders—meaning a pattern of transhumance—albeit modified. Here, the company does not intervene in how or where the resource is extracted; in other words, the llareta camps have never been modern; modernity is found in the relationship between the business owner and the indigenous worker, and is focused on the final product.

Objects: Metal Containers

The world of objects that survives on the surface of the sulfur and llareta camps today is to a large extent of industrial manufacture, reflecting the increasing availability of such objects as well as the expanded territorial connectivity. Most of these objects are from the domestic sphere, and consist mainly of food containers (tin cans and bottles, for example), while just a few are from the productive realm (objects related to extraction and transportation). The predominance of the former type is coherent with the camps' location far from extraction and processing areas.

The tin cans are the most conspicuous example of the adoption of a new technology that helped to facilitate and diversify the workers' diet (Fig. 10, left). The administration supplied products brought from Calama and Chuquicamata, and discounted their cost from the workers' wages. The testimonies of these workers confirm that they requested tinned food from the mine management to consume while at work, but they also requested extra rations to take back to those who had remained behind in their places of origin, to spend their days pasturing the animals by taking them up into the hills. Among the tins identified were global brands such as Nestlé (Nescafé coffee) as well as Chilean brands such as Deyco, Calypso, Pescador, and Van Camp's (all seafood products) (Silva 2014). At the *estancias*, it was usual for the herders to eat *charqui*—dried meat that was prepared by hanging it from the ceiling of their rooms, and soaking it in water when needed. But to make *charqui*, they would have had to kill and butcher



Fig. 10 Metal objects: food containers from Gutiérrez 2 (left) and cream container from Gutiérrez 1 (right)

an animal. The availability of tinned food freed the herders from this process, and in doing so standardized their food portions into a pre-established amount, defined by the tin (unit of measure/consumption). The scarce quantity of animal bones is particularly dramatic in llareta camps as they take 2.5% and 1.7% of all the materials recovered, in Gutiérrez 1 and Gutiérrez 2, respectively.

In this context, it is interesting to examine two linguistic references that former sulfur and llareta workers use to refer to these tinned foods, because they illustrate the liminal space/time that these objects occupied in their mode-of-dwelling-in-the-puna. The first comes from an old man from Machuca, who, while preparing lunch at his home in San Pedro de Atacama, asked a member of our team to open a can of tuna for the salad by asking him to “carnear” the tin (Luis González, pers. comm. 2015). The verb *carnear* is the same one this older man would normally use for killing and butchering an animal (and ultimately making *charqui* out of it) before consuming it. Obviously, he was aware that he was referring to a pre-established portion of ready-to-eat food that was accessible after merely opening a tin. Nevertheless, he referred to his “prey” in the same way he would refer to a live animal that needed to undergo all of the steps involved in killing and butchering. In that context, it seems that the arrival of tinned food, and the modern technology it implied, was all the same to this old man. In the modern industrial world, tinned food often has been found in contexts that have a more formal approach to food, the epitome of which is meals served at a table, with dishes and cutlery. In this case, that is precisely what occurs—the “killed and butchered” tuna would end up on a plate of salad alongside other ingredients and distributed to diners sitting at a table. Yet the tin is treated in a way that fits the context (and temporality) of the herder.

The second case in which the use of language is suggestive comes from another old man, also a native of Machuca. When he returned to visit his former place of employment, the Gutiérrez 1 llareta camp, he saw the cover of a tin of ointment on the ground and remarked to us, “Look, mentolatum! Things were already civilized then.” While the item was not tinned food but rather ointment bearing the words “Farmacia Cotoras” (Fig. 10, right), it is remarkable that the man conferred the values

of “civilization” and “modernity” on the metal object. On the one hand, the cream quickens healing of respiratory complaints that are common at high altitudes, replacing the herbal remedies with a tin that encapsulates a series of activities—gathering herbs, crushing and distilling them, etc. On the other, the container can only be obtained in special shops in urban centers, in this case from Farmacia Cotoras (also the brand name of the ointment) in Chuquicamata. Interestingly, while the brand tells us that the product was locally manufactured, the man refers to it as “Mentholatum”—an international brand of the same ointment. In that regard, the ointment in the tin is what is globalized, and it is what brings the inhabitants of the Puna into the modern world without borders; one can now be civilized, urban, and even international, even in the Atacama Puna.

In our opinion, that “civilizing modernity” of the ointment tin can also permeate somewhat the “butchering” of a tin of tuna, although that example is not as explicitly literal. Having objects/merchandise that streamline the process of eating and reduce the size of the “prey”—making it more portable—offers an advantage that differentiates those who have them, and those who do not. The same can be said of the introduction of motorized vehicles, particularly trucks, for mining work. In their testimonies, former workers from the locality have emphasized that the most prestigious jobs were that of a trained driver or mechanic, though this also required leaving behind the use of the donkey cart (Garrido 2016, Richard et al. 2016). Knowledge of truck driving operated as currency, diversifying and enriching the workers’ knowledge beyond herding and making them versatile—and therefore competitive—as employees.

There’s a dual operation here, with mechanical technology delivering more speed and greater load-carrying capacity than pack animals, while inversely, the trucks are transported into Puna temporality through the “animalization” of the vehicle—the herder-drivers drive them like pack mules, “hanging” them vertically downhill instead of driving down the zig-zag roads they use to drive them slowly uphill (Garrido 2014, Richard et al. 2016). As Richard et al. (2016) have commented, there is a transfer of knowledge from the animal to the truck, in this case via a herder, that is also symbolically enhanced by the fact that the herders baptize their trucks with names, as though they were domestic animals. A similar thing occurs with the tin of tuna, which is also linguistically animalized.

Discussion and Conclusions: The Temporality of the Herder/Worker

Specific Knowledge and Cultural Capital

We have identified at least three modes of building in the Puna, ranging from the most canonical industrial (SACIEL) to the eminently pastoral (Gutiérrez 1 and 2), with the difference between these being the influence of specific indigenous knowledge. In other words, the different modes of building can be understood by identifying the agents and their degree of participation in the planning, construction, and exploitation of the resources involved (Comaroff and Comaroff 2011), in this case sulfur and llareta.

From ethnographic studies we know that the sulfur and llareta operations, as productive spaces, included conventional roles similar to those of any capitalist

workplace, such as differentiated work duties and hierarchies. The hierarchy was top-down, with the concession holder or business owner at the top, followed by the intermediary (known as the *patrón* or boss), then the *capataz* or foreman, and lastly the workers (Garrido 2016). Both the owner and the intermediary were usually from outside the region; in contrast, the foreman, who was closer to the actual operations, tended to be a local (indigenous) (Garrido 2016). Returning to the Comaroffs (2011), it is important to identify the agent in the acts of planning, constructing and exploiting, as it is precisely that agent who initiates the process of transforming indigenous practices and knowledge into commodities.

In industrial operations like SACIEL, therefore, the workers' duties revolved exclusively around extracting the mineral, with an entire range of specialized trades that this work implies (pickers, crushers, etc.). The agents that plan and construct were, in contrast, the capitalists (owners or intermediaries). As an operation's profitability diminished (whether due to reduced volume, quality and/or accessibility of the mineral, or a lack of capital, etc.), the indigenous workers intervened more in tasks that went beyond mere ore extraction. At Ojo de Toro, for example, which is a much smaller-scale operation than SACIEL, the owners took advantage of the indigenous workers' versatility. In other words, the owners planned while the workers built (roads and camp), as well as extracting sulfur. In doing so the latter used a body of traditional knowledge about local materials and technologies for constructing stone buildings, raised earth beds, storage structures, and roads.

The Gutiérrez 1 and 2 llareta camps, in contrast, exemplified an ethnic economy from the start (Comaroff and Comaroff 2011), with the entire productive process—planning, building, exploiting—revolving around native parameters. Nevertheless, the task of planning was shared with the capitalist, who participated in the business by providing the venture capital. The capitalist's investment, however, was relatively low, and included only the payment of a piece rate to workers per volume of llareta (truckloads) and the purchase of the trucks for moving the product (llareta). The company's venture capital, therefore, decreases in direct proportion to the timely use of traditional knowledge. It is thus the indigenous workers who ensured the feasibility of the business with their traditional knowledge (locating and accessing the plant, properly handling the trucks in the local landscape).

As we have seen in the previous examples, indigenous knowledge in the new high altitude industrial contexts is recursive (Franklin 2013). In other words, traditional knowledge acts as cultural capital (Bourdieu 1986) that enabled the inhabitants of the Puna to work as laborers, making use of the knowledge gained previously from their time in the world of mountain herding. When commodified, that knowledge is organized and/or distributed in accordance with the participation of the different agents who control the productive process. This positions the indigenous people as a workforce in these operations, while at the same time allowing them to be recognized and hired as experts for their technical knowledge of the non-human resources of the Atacama Puna. Thus if we understand “traditional knowledge” as a capital, it enters a field (Bourdieu 1990) as a system of social relations defined by the possession and production of traditional knowledge which is — to a greater or lesser degree — autonomous; the dominant or dominated position of the participants within the field is defined precisely at the intersection of technical-industrial or pastoral modes of action (selection of materials; construction of houses, corrals and roads; forms of feeding, clothing, heating,

etc). Thus the competitive struggle between llareta or sulfur mining owners and intermediaries on the one hand and laborer-herders on the other over the use and usufruct of traditional knowledge is vital for the viability of extractive mining companies. It indubitably establishes a hierarchization between those who possess indigenous capital and those—the business owners—who aspire to possess it. It is also clear that the intermediaries would be mediators or operators of traditional knowledge in industrial processes, in a specific dynamic in which the rules move according to the movement of the dominant and subaltern positions of the owner, intermediary, foreman and laborer-herder.

By examining the contours of the material-industrial world, we have seen that the most visible mode of expression of indigenous knowledge is found in the road system used for llareta extraction, as well as in building techniques such as accessing a supply of materials and making structures. But it is also evident in how certain elements of the industrial material world, when fit together with the herder temporality, are able to generate local practices, meanings and relations and reveal particular frameworks for action as a result of that same traditional knowledge. New technologies, for example, are mobile, they are distributed beyond the industrial sphere. This mobility is expressed in artifacts (such as tins of food) and/or knowledge that increase efficiency and maximize the output of longstanding practices, thus encouraging their “export” to their own homesteads.

While many former Puna herders—those who worked in the sulfur mines especially—recall how they were treated unfairly in the workplace and suffered extreme poverty (Garrido 2016), they also recall practices that illustrate their control over their own cultural capital. In other words, they themselves commodified their specific knowledge in the new industrial context. A case in point is the itinerancy of workers among both llareta and sulfur enterprises. In effect, it was more attractive for the Puna herders to work “at piece rate”, which one elder from Machuca summed up by saying, “the more you move around, the more you make.” After all, they were the only ones capable of working at such high altitudes. At the same time, former workers describe their continued participation in ceremonies and rituals, such as the “payment” to the land, the patron saint festivities, and animal “flowering” celebrations, which very often were times when neighboring communities near their home villages got together to celebrate and socialize. Participating in these celebrations meant leaving work sometimes for several days, and the business owners allowed these absences.

These, it seems, were the elements that helped to maintain the social-symbolic balance of the Puna workers, who actually never stopped being herders but were “herder-workers” who became herders, then laborers, then herders again. This operation led to horizontal treatment among the different agents in the taskscape that those “herder-laborers” inhabited, including those incorporated by the new capitalist industrial order. After all, it is that same taskscape of the dwelt-in-Puna that allowed the herders to enter and exit—or, one could say, practice transhumance in relation to modern industrialization.

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