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# TRANSFORMATIVE ARCHITECTURES: AN ARCHAEOLOGY OF BUILDING PRACTICES IN THE ATACAMA DESERT

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*Ni agua ni verdura; tan sólo piedras y arena. Arena por todas partes y a lo lejos, cordones de cerros bajos, quebradas llenas de guijarros redondeados, silenciosos testigos de corrientes remotas que, en lejanas edades, vertían el vital elemento por estos cauces desecados que, por siglos y siglos, aguardan con angustia la liberación del agua viva. Es la poesía del desierto: la silenciosa espera de lo que quizá no vendrá.*

Ricardo Latcham, 1926.

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## INTRODUCTION. Searching for material connections, telling stories with things

*Where is that wonderful, big, long, hard thing, a bone I believe, that the Ape Man first bashed somebody with in the movies and then, flung up into the sky, and whirling there it became a spaceship thrusting its way into the cosmos to fertilize it and produce at the end of the movie a lovely fetus, a boy of course, drifting around the Milky Way without (oddly enough) any womb, any matrix at all? I don't know. I don't even care. I'm not telling that story. We've heard it, we've all heard all about all the sticks and spears and swords, the things to bash and poke and hit with, the long, hard things, but we have not heard about the thing to put things in, the container for the thing contained. That is a new story. That is news.*

- Ursula Le Guin, "Carrier bag theory of fiction", 1986.

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In her 1986 essay "The Carrier Bag Theory of Fiction", Ursula Le Guin reimagines human history through the figure of a container. Instead of weapons designed to kill by throwing, sticking, and digging, she writes an evolutionary story that pushes against the primacy of the spear and arrow. Swords, Le Guin argues, are the tools of the male Hero; the one who conquers by dominating. Bags are instruments created to gather, to hold, to carry. Le Guin's invitation is to avoid the "linear, progressive, Time's-(killing)-arrow mode of the Techno-Heroic", redefining technology and science as primarily a cultural carrier bag rather than weapon of domination. Her strange realism is premised on a vision of technology that does not correlate with the one advanced by modern science, and the bag allows us to rethink stories without heroes, and history

without teleology. This dissertation takes Le Guin's provocation to think humans' relationships to things differently as a point of departure, asking broadly: what kind of history can we imagine and tell if we think about objects in the world without presumptions of domination and control?

The project examines the construction, organization and use of architecture in the valley of Guatacondo, Atacama Desert, during the Formative Period (ca. 1000 BCE—500 CE). More specifically, this research considers the relationship between collectivities and technologies through an investigation of building practices that seeks to elucidate how these landscapes emerged and transformed. I investigate how architectural spaces were assembled in order to better comprehend the processes of formation of a landscape that archaeologically appears as a stable and consolidated agro-economic system.

The Formative period has been generally characterized as a historical process that marks the shift from mobile lifestyles based on hunting and gathering to settled communities of farmers, signaled by the creation of villages, food production, and the use of technologies such as pottery and metallurgy. Echoing the Neolithic paradigm of the Old World, in the Andes the Formative has been understood in different registers: as a technological transformation, a chronology, a mode of subsistence. Cultural changes have been traditionally explained through diffusion and colonization, and archaeologists studying processes of social complexity—the emergence of political hierarchies and social inequalities—have often turned to monumentality as an index for the existence of authorities and/or political elites capable of organizing human labor at large scales, such as public buildings or irrigation networks. Conventional models seeking to explain this transition in the Americas have relied heavily on evolutionary frameworks, approaching this process as a socioeconomic and technological threshold driven by the adoption of agriculture (Johnson and Earle 1987; Sahlins and Service 1960; Willey and

Phillips 1958). In these models, the labor and technological demands of food production paved the way for the transition to sedentism—including the creation of infrastructure for storage and habitation that led to the formation of permanent settlements, setting the conditions for population growth and the development of complex sociopolitical forms. In this context, permanent architecture and the formation of villages have commonly been regarded as proxies for sedentary life and residential stability, offering the material conditions for the success of agricultural regimes and the formation of hierarchical structures (e.g., Flannery 1976; Hayden 1990; Hodder 1990; Upham 1990). While recognizing the importance of these approaches, the emergence of villages has been reduced to an epochal event that erases the long, messy process of settlement formation itself, including ongoing experimentation, the movement between places, practices of maintenance, histories of occupation and abandonment, material improvisations, and reversals. Consequently, historical contingencies have been effaced, agencies disregarded, and material trajectories overlooked, producing a picture in which permanent settlements tend to appear as spontaneous creations.

The valley of Guatacondo concentrates evidence that has been considered paradigmatic of the Formative process, such as agricultural infrastructure (irrigation networks and farming fields), pottery, and mud architecture, including some of the first agglomerated settlements of the Atacama Desert, the sites of Ramaditas and Guatacondo-1 (Meighan and True 1980; Rivera 2005; Urbina et al. 2012). Research along west-flowing seasonal streams has yielded no evidence of permanent habitation during the previous period (Late Archaic), making Guatacondo the earliest loci of occupation with durable mud structures organized in clusters of diverse proportions. The distinctive features of this constructive tradition are found at the largest site in the valley, Guatacondo-1 (G-1), which includes the construction of semi-subterranean enclosures

(usually 5-20$m^2$) characterized in the literature as houses or domestic units, the use of rectangular mud bricks as well as spherical bricks that were apparently made by shaping balls of wet clay, small windows and doorways, post holes for the placement of roofs, the use of rounded stones of considerable size in the walls of some of the enclosures, the presence of pits that served as storage bins, and anthropomorphic and zoomorphic figures modeled on the walls of some buildings (Mostny 1980). This project focuses on the study of four sites in the valley, including G-1, that show different spatial configurations and variations on the architectural pattern described above. The sites of Ramaditas, Guatacondo-2, and Guatacondo-4 show different degrees of aggregation, layout, and distribution, but repeat the basic form and characteristics of the individual circular enclosure. Aside from the construction of large circular patios that have been interpreted as plazas (Adán et al. 2013), sizes and features of single structures are remarkably uniform, suggesting that there were no significant material differences between units or spaces constructed for specific functions. Moreover, scholars working on the study of Formative period groups in the Atacama Desert have found no evidence of centralized authorities or any form of regional socio-political integration that could account for the standardization of architectural forms. The variations in spatial configurations between these sites, as well as their temporal differences, have not been considered to formulate interpretations about the occupational history of the valley, or how these places might have been used. Moreover, they have been generally described as "villages", a category that tends to elide their historical specificities and assume a specific function prior to archaeological examinations.

Despite what at first glance appear to be consolidated, stable, farming communities with complex settlement systems living in the valley at this time, recent evidence indicates that mobility continued to play a significant role in the organization of these groups and that regional

traffic and trade was intensified, as well as the reliance on gathered foods, suggesting that the occupation of these sites was much more sporadic than what had been previously stated (Adán et al. 2013; García et al. 2014). Stable isotope analyses of human remains have clearly indicated a gradual transition to domesticated crops, especially maize, which was integrated into the existing and continuing hunter-gatherer diet strongly based on marine resources and wild fruits (Santana-Sagredo et al. 2015). Excavations in Ramaditas and Guatacondo-1 have shown discrete occupational layers that are not related to what has been considered as domestic activities, such as cooking or eating. Thus, it offers an interesting example to contest conventional claims about the correlation between architecture, sedentism, food production, and social complexity, especially in the absence of material indicators of centralized institutions or sociopolitical stratification. Taking this evidence into account, this research asks broadly: How did small-scale societies comprised by autonomous groups without centralized institutions make spaces to live and work together? How did they create ties to secure and sustain their collective relations?

In thinking about the questions that animate this project, I depart from traditional models that seek to explain the Formative process through evolutionary frameworks and political economy by reconsidering the social importance of an often taken-for-granted and mundane task: building. I suggest that the project of building created communal ties that helped reproduce social relations through collective actions such as the organization of work for construction, access to resources employed in the production of architectural spaces, and shared technical knowledge. Through the act of building, these groups maintained and actualized collective relations—creating not only places but the community itself. By understanding building as a practice of making places that entangles people and things through space and time, I shift the focus from the function of architecture—seen as the main setting for domestic activities or as an

index of sociopolitical structures —to its construction, organization, and use. Attending to the emergent conditions of social integration through the development of collective projects, this research addresses three broad sets of questions:

1) *What kinds of practices and skills were involved in creating the built environments of the Guatacondo Valley?* More specifically: What were the materials used for building the architecture of the Guatacondo Valley (Atacama Desert) during the Formative Period? How were these places assembled and used? What kind of resources did people access? Was building a specialized craft? What kind of processes were involved in manufacturing building materials? What is the relationship between the uniformity of individual enclosures and the materials employed to build them? What are the main differences in construction and use between sites? Do building practices change over time?

*2) How did the use of new technologies change the ways in which people related to this landscape?* What forms of social interactions did these places enable? What are the material relationships between the architecture of Guatacondo and other places with Formative period occupations in the Atacama Desert? In what ways did the practices and actions involved in construction placed new demands on the social organization of these groups? To what extent was the Formative a process of rupture with previous forms of social organization?

3) *What forms of politics are created by engaging in collective projects that do not rely on centralized institutions that organize labor at large scales?* How can we understand the social organization of these groups without resorting to the conventional explanatory models of social complexity for the Formative Period? What kinds of activities were carried out in these different spaces? What can be inferred in terms of the sociopolitical

organization of these groups based on the nature, scale, histories of occupation, and use of the built environments they created?

Through a reconsideration of architecture as a long-term project that involved different temporal rhythms, practices of materialization, technical skills, and work organization, this research offers a textured approach to the problem of the emergence of settlements by focusing on the implementation of architecture. Instead of approaching this landscape as a finalized object, I use a multi-scalar approach that treats buildings—from mudbrick walls to the materials used to build enclosures and settlements—as *emergent assemblages* (Haraway 2016; Tsing 2015) of matter and actions, brought together through the entanglement of multiple elements, places, and actions, transforming the landscape while simultaneously building the social groups engaged in their production. By viewing architecture as a transformative practice, this project traces networks of human and technological entanglements to 1) provide insights into everyday practices of building and dwelling and the ways in which technological histories accrue in the material transformation of the landscape; 2) propose an alternate way of studying the agricultural village through a detailed exploration of situated architectural projects.

## Cyborg Architectures, Machinic assemblages

In "A Thousand Plateaus", Deleuze and Guattari declare (1980:90): "A society is defined by its amalgamations, not by its tools". Their presentation of the rhizome as a system of thinking and being, insistently associates the word *intermingling* to describe the workings of the assemblage. Against the vertical and genealogical branches of the tree, the rhizome brings into

view lateral connections, non-hierarchical entanglements. This dissertation takes the Deleuzian assemblage as a point of departure to explore material connections between humans and things. It joins recent efforts in archaeology that seek to work against the grain of mechanical conceptions of the material, engaging with the architectural as more than a backdrop to social life. Taking into consideration the potential built environments offer for understanding technical choices, the organization of labor, craft specialization, and technical knowledge, this project focuses on ordinary connections between buildings and builders that have often been disregarded in favor of broader timescales and general processes of cultural change (e.g., Bille and Sorensen 2016; Hodder 2011; Love 2013; Pauketat and Alt 2005; Vellinga 2007).

Much of these interventions have been inspired by non-representational theories of materiality, loosely labeled as 'New Materialisms', some of which take the Deleuzian assemblage as a central concept. Broadly, this literature responds to the concern that social theory, following post-structuralist critiques, has relied heavily on discursive forms and constructivism, disregarding the role of matter/materiality in their analyses[1].

[1] Sara Ahmed (2008) critiques this "founding gesture" within "new materialism", which points to feminism particularly as being routinely anti-biological or "social constructionist", and therefore presenting itself as offering new possibilities for feminist thought. Essentially, for her, "new materialisms" have created a straw-man argument by choosing not to engage with key literatures within the genealogy of feminist thought that deal specifically with the material (such as Donna Haraway, Sandra Harding, and Sarah Franklin, among others). Both "new materialisms" and STS owes much of its formulations to the concerns that were first raised by feminist scholars in the sciences, which is briefly addressed here.

From this point of departure, "New Materialism" has moved in different directions while retaining a shared commitment to materialization as a set of complex, relational, open-ended, and highly contingent processes, informed by the productivity and resilience of the material (e.g. Barad 2007; Bennett 2010; Ingold 2007, 2013; Latour and Yaneva 2008; Miller 2005). The relational approach advanced by these theories stresses the ways in which humans are characteristically enmeshed with things and other-than-human entities, and therefore do not stand apart from them. Not willing to fully jettison the lived immediacy of experience, relationality explores the processes of emergence of the material, attuned to the idea that objects are never quite solidified or sedimented. In this context, building is a performative practice—or a *doing*—that can never be fully separated from design and use (Ingold 2013). Instead of seeing the material world as a blank slate for the projection of symbolic, religious, economic, and political orders, these formulations recognize matter as a vital force—aggregative at times, disruptive at others—rejecting humans as the sole possessors of agency. Through this, they challenge the modernist impulse to enact separations between subjects and objects, form and matter, and nature and culture, drawing attention to the political and ethical ramifications embedded in these epistemologies (Barad 2007; Bennett 2010; Coole and Frost 2010; Haraway 2003; Latour 1993; Thrift 2008; Witmore 2014). Following Jane Bennett (2010: viii), I consider architecture as having "vibrancy", admitting that the material has "sufficient coherence to make a difference, produce effects, alter the course of events". Thinking about architecture through vibrancy has the potential to make structures tremble, opening spaces for understanding buildings as more than a movement of stabilization and permanence. While Bennett tries to track the moment in which objects reach a level of independence from subjectivity and become the "other", my aim here is to signal towards the ways in which the material is always enmeshed with the human, and to

make visible certain connections between buildings and builders that have been frequently disregarded in archaeological studies in the area. To circumvent the epistemological reliance upon a world of stable objects, we need to recognize that the human-building assemblage has an efficacy, a capacity to create things as an entanglement instead of independently, effectively decentering the subject as the sole source of agency. Treating architecture as a "doing" enables us to think about it as more than a physical manifestation of a social order, an allegory of a society, or the materialization of a style, moving away from approaches that attempt to read built environments as texts, icons, or symbols. Materials need to be extracted, manufactured, worked, and maintained, a host of activities that occur in the shaping of stuff. Here, the work of architecture is analyzed in its performative dimension, admitting that these projects have the capacity to mobilize a collective that is partially constituted as such through networks of materials and actions. I expand upon current discussions of the limitations posed by traditional models of the origins of sedentism, drawing attention to contingency and relationality by being attuned to the pace and scale of building practices that unfold along paths that cannot be predicted in advance.

Feminist insights into technology help situate architectural projects outside the mechanical frameworks of the material. Critiques of the gendered nature of technical expertise troubled the idea that technological projects were simply the product of rational choices. By insisting on the intimate relationality and physicality of the associations between humans and things, these theorizations acknowledge the porosity of boundaries between bodies and environments, formulating an ontology that negates the existence of bounded or fixed entities (Haraway 1999; Harding 1986; Faulkner 2001; Strathern 2004; Wacjman 2009). By dislodging the notion of technology from rationality and progress and recognizing the reliance of humans on

things, techno-feminism reintegrated the domains of the technological and the social, admitting that they are integral to the constitution of the self and the collective. Beyond their concern for human-nonhuman relationality, techno-feminist insights have described the processes of naturalization, normalization, and politicization that accompany large-scale collective action. Such scholarship tutors my own efforts to study the formation of collective life as always already emergent within contingent human-nonhuman interaction.

This project incorporates this critique to reconfigure the ways in which we understand technology in archaeology. Rather than considering it as the relationship of social actors with their material conditions, or the tangible techniques of object-making (Dobres and Hoffman 1994), here human collectives or communities are seen as constituted through an engagement in technological projects, co-emerging through processes that cannot be disentangled or isolated. In other words, the social body can be understood as an assemblage that is materialized as such through a set of connections that extend across space and time. Making mud bricks, assembling structures, creating settlements are not simply activities that carry functional weight but rather they create long-lasting attachments to places and other humans. The steps involved in the act of building—including procurement, manufacture, use, maintenance, and repair—are not carried out individually but collectively.

Haraway's cyborg is a figure that inspired the approach that this project took to understand architecture as a technological project. The cyborg emerges in Haraway's writing as a powerful tool for criticism, exploding fixed boundaries and denying the existence of purified epistemological or political categories. It is a hybrid creature that arises amidst dreams of a new global order, as a product of militarism and industrial capitalism (Haraway 1991). The messy and polluted cyborg came to disrupt traditional feminist understandings of technology, which thus far

had been equated with a masculinist rationality, capital exploitation of nature, and imperial and military power. As a form of exploring new unstable identities and forms of sociality, cyborgs troubled the cohesion of feminism's identity politics and positivistic epistemologies. Through the cyborg myth Haraway insists on the intimate relationality and physicality of our associations to nonhumans, admitting the porosity of boundaries between the organic and non-organic, the physical and the non-physical, the body and the environment, productively challenging the notion of bounded, impermeable entities. By formulating an ontology that negates the existence of an unadulterated or fixed nature and instead accepts the infiltration of technologies in the creation of "naturecultures" (Haraway 2003), she imagines a world populated by wondrous creatures that are both human and technological, where subjectivities arise only through the entanglements with institutions, practices, discourses, and technologies. As she points out, "beings do not pre-exist their relatings" (2003:6).

## Assembling a prehistoric landscape: moving between scales

The notion of assemblages lends itself to the kind of scalar work that archaeology does, which often requires synthesizing very intimate encounters with processes that lasted millennia. Among the recent research of the Neolithic process, some studies inspired by relational thinking (e.g. Fowler 2013; Harris 2017, 2018; Pauketat 2013; Robb 2013, 2014; Robb and Pauketat 2013; Roddick 2013) have contended that the origins of the transformations associated with agriculturalization have been approached at large scales, and consequently, are required to explain big processes: environmental transformations, plant and animal domestications, the

emergence of social stratification, to name a few. In turn, the resolution of data at smaller scales becomes less relevant to understand, losing sight of local histories and material trajectories. The tension between the study of socio-historical processes that unfold at broad temporal and spatial scales (sometimes millennia, like the case of agriculturalization) and the desire for understanding human actions and behaviors in everyday contexts, reveals the difficulty with which the discipline has moved between ethnographic and archaeological time, without necessarily an intention to breach the divide. To some, the study of agriculturalization must be approached at multiple scales of analysis to avoid reductionism and escape the old ghost of determinism. The conceptual and methodological work that assemblages do moves us away from the historical-processual and functionalism/determinism that was prevalent for much of the history of archaeological thought in the twentieth century. Reformulating its ontological grounds to resist the impulse of dichotomizing the world, an archaeology that is attentive to the work of assemblages: 1) blurs the boundaries between objects and subjects, acknowledging the vibrancy of the material world. It rejects the passivity and reductionism of the material to a static entity, focusing instead on how things come to be, are created, and emerge; 2) draws attention to both small-scale events and large-scale processes, allowing us to explore the past at different levels.

Taking some of these discussions into account, in this dissertation I follow a multi-scalar approach that combines compositional, architectural, and spatial analyses to document building practices, and to understand the spatial distribution of sites, agricultural fields, and irrigation canals, using aerial imagery to reconstruct and visualize their connections. The material analysis was based on data I collected at four different sites along the ravine: G-1, G-2, G-4 and Ramaditas. All of them were built using a combination of mud, mortar, and stones to form circular enclosures of variable sizes and layouts, spanning the diverse spectrum of mud

architectural types in the valley. I track the transformation of mud from a raw into a social material through building practices, using a combination of analytical methods that included the geological characterization of soils, petrography, and testing for plant microfossils. A total of 16 samples were obtained across the four sites, in addition to a control sample from the natural soil near Ramaditas, which were analyzed by specialists at the Archaeobotanical Laboratory at Universidad de Chile and the Sedimentology Laboratory at Universidad Andrés Bello. The microscopic exploration of soils was designed to establish similarities and/or differences with soils found naturally in the ravine, and to ascertain whether soils with specific qualities were selected according to different constructive techniques. My site-based analysis focused on the architectural documentation of the sites, recording basic metrics on a standardized sheet (Figures A.4 and A.5), in order to understand the techniques employed for the construction of earthen buildings at these four sites. With the collaboration of colleagues working in a multi-year archaeological project ("La Frontera Interior", or LFI) funded by the *Agencia Nacional de Investigacion y Desarrollo* (ANID) in Chile through their FONDECYT program, I conducted an intensive pedestrian survey outside of the largest site of the valley, G1. Following a large-scale survey conducted in the Summer of 2014 around Ramaditas in the context of a different archaeological project[1], the purpose of this survey was to characterize the spaces outside the boundaries of villages, which based on the literature and our own research, yielded extensive evidence of human occupations. The pedestrian survey was done in conjunction with aerial surveys using a drone, and I processed the images to produce a photogrammetry of the valley covering approximately 6 $km^2$. In the context of the LFI project, we conducted excavations of

[1] Fondecyt Project #1130279, "Arqueología de la Pampa del Tamarugal: EL Período Formativo como discursos sobre naturaleza, cultura, resistencia (ca. 400 AC-900 DC)". P.I: Mauricio Uribe Rodríguez.

two open-air sites in the valley to provide a characterization of these types of occupations, which according to their radiocarbon dates, were used contemporaneously with the sites. This the valley-based analysis followed and documented the material traces of everyday lives outside the bounds of houses and villages, revealing a network of overlapping places that gives us a glimpse of what this landscape looked like two thousand years ago.

The analytical frame, therefore, was designed to move from face-to-face interactions—like wall-building—to intergenerational connections among different archaeological spaces. The limitations of this scalar approach are clear: because it focuses on the materiality of mud, it omits the importance of other materialities that were also recursively transformed by the social, most notably stone and timber. In addition, because it privileges an extended approach to space, it obscures diachronic changes, giving us little information about temporal depth. The question of history, then, becomes one that is difficult to address through this particular approach. But at the same time, these scalar moves help me depart from conventional readings of the process of agriculturalization by decentering traditional objects of archaeological inquiries: from villages to landscapes (Chapter 2), and from houses to building practices (Chapter 3). These hybrid analytical spaces—the "outside" of villages and the mud that makes buildings—reveal specific historical trajectories instead of generalized evolutionary accounts. Rather than the heroic histories written to and by the white male the Le Guin so emphatically writes against, this work is committed to incomplete and partial stories that straddle scales, bringing into view specific snapshots that follow the material from one plane to another. And because these stories speak to a different historical imagination, one that is not committed to progressivist temporalities or absolute spaces, their exploration mobilizes "nature" as something that is not separate from

politics, culture, or history, pushing against the modernist fantasies of the Neolithic/Formative paradigm.

## Structure of the dissertation

Based on the data recovered from my fieldwork, the results and arguments advanced in this dissertation were organized into four chapters. The first one, "The spectacular conquest of nature", begins by considering the history of archaeological discussions surrounding the "origins of the village" and examines the epistemological underpinnings from which such debates emanate. It discusses how models that seek to explain the transition from hunting and gathering to farming have been imported from the Old World and adapted to a variety of archaeological scenarios in the Americas, resorting to teleological logics that erase the particularities of local material trajectories. I connect these explanations with the figure of the desert and argue that this particular landscape functions as a laboratory for the construction and proliferation of evolutionary narratives that accentuate concepts as *adaptation*, *domestication*, and *progress*, because it has been constructed quintessentially as the space of Nature. I discuss how the Atacama became a "modern" space through scientific explorations and industrial projects beginning in the 19$^{th}$ century, effectively separating it from the domain of the human, and coinciding with the beginning of archaeological research in the area. In this context, permanent villages—invariably associated with the onset of large-scale agriculture—are commonly perceived as adaptive responses to a hostile and extreme environment, representing the successful "domestication of nature", and feeding fantasies of colonization of spaces that seem wild or unruly.

The second chapter, entitled "Contesting Narratives of settled life", investigates the archaeology of early villages in the region, situating the Guatacondo valley within this broader context. It begins by tracing the history of inquiries into built environments in anthropological and archaeological literature. Departing from these approaches, I outline a conceptual framework to architecture that shifts the focus from the finished product to the process of assembling buildings, offering a theoretical proposition that focuses on the social work that built environments perform, and the kind of relations they enable in the context of place-making projects. I argue that a more capacious understanding of architecture, one that is better equipped to capture and imagine worlds in different ways than the ones we currently inhabit, requires a reconsideration of the role of technologies—understood as instantiations for the constitution of communities and the actualization of histories of knowledge practices, rather than historical inevitabilities. Drawing on recent archaeological investigations in the area, including this project, this chapter offers material evidence that problematizes common assumptions about how the "Neolithic" process unfolded, effectually decoupling permanent architecture from sedentism, agriculture, and the emergence of social hierarchies. It does so through an examination of mobility and the exploration of everyday life outside the bounded space of the village.

The third chapter, "Deconstructing villages: microscopic elements and big assemblages"—returns to the question of how to think about villages outside common narratives of settled life. As a response, in this chapter I develop a textured approach to the formation of the archaeological sites that are at the center of this investigation. I center on the technological implementation of architectural projects, moving from the microscopic elements that comprise the materials employed for building, to large assemblages of architectural materials.

Drawing from the set of analytical and conceptual approaches outlined above, the last chapter—called "Transformative Architectures"—details the connection between material technologies and the social body. I propose that building was a communal practice that brought people, knowledge, and materials together, in a constellation of activities that did not simply carry functional weight, but that created long-lasting attachments to landscapes and to other humans. In the absence of centralized institutions to direct production and labor, I contend that architecture itself had the capacity to constitute the very collective engaged in its creation. Rather than "formative", this project addresses the construction of places as "trans-formative", precisely to signal the ways in which they are always open to new interventions and histories that cannot be predicted in advance. What is at stake in the analytical move of making connections between buildings and builders visible is accepting the infiltration of technologies in the creation of what Donna Haraway (2003) has called "naturecultures", a folding of what are often considered as separate domains. Treating them as independent categories not only perpetuates a framework that renders such opposition universal, but also sustains the complicity between discourses about the past and histories of colonial and ecological exploitation.

## CHAPTER 1. The conquest of Nature

*In the Old World, nations and the distinctions of their civilization form the principal points in the picture; in the New World, man and his productions almost disappear amidst the stupendous display of wild and gigantic nature [...] On no other part of the globe is he called upon more powerfully by nature to raise himself to general ideas on the cause of phenomena and their mutual connection.*

- A. Von Humboldt, "Personal Narrative of the Travels to the Equinoctial Regions of the New Continent", 1814.

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In the early morning of January 26, 1963, engineer Emyl de Bruyne flew over the valley of Guatacondo in search for "Indian ruins" that had been previously reported through geological explorations. American businessman James Keighley had photographed the "ruins" two years earlier while claiming mineral fields in the Pampa del Tamarugal. The photographs landed in the hands of Robert Hamilton, a geologist working for the Chile Exploration Company (Chilex) (Mostny and Niemeyer 1963), the same company that employed de Bruyne in Chuquicamata, the site of one of the largest copper fields in the Atacama Desert. Chilex was owned by the Guggenheim Group until 1923, when the operation was sold to the Anaconda Mining Company, another American corporation that counted the Rotchschilds and the Rockefellers among its early investors. James Keighley worked for this company at the time he photographed the ruins of the lost town.

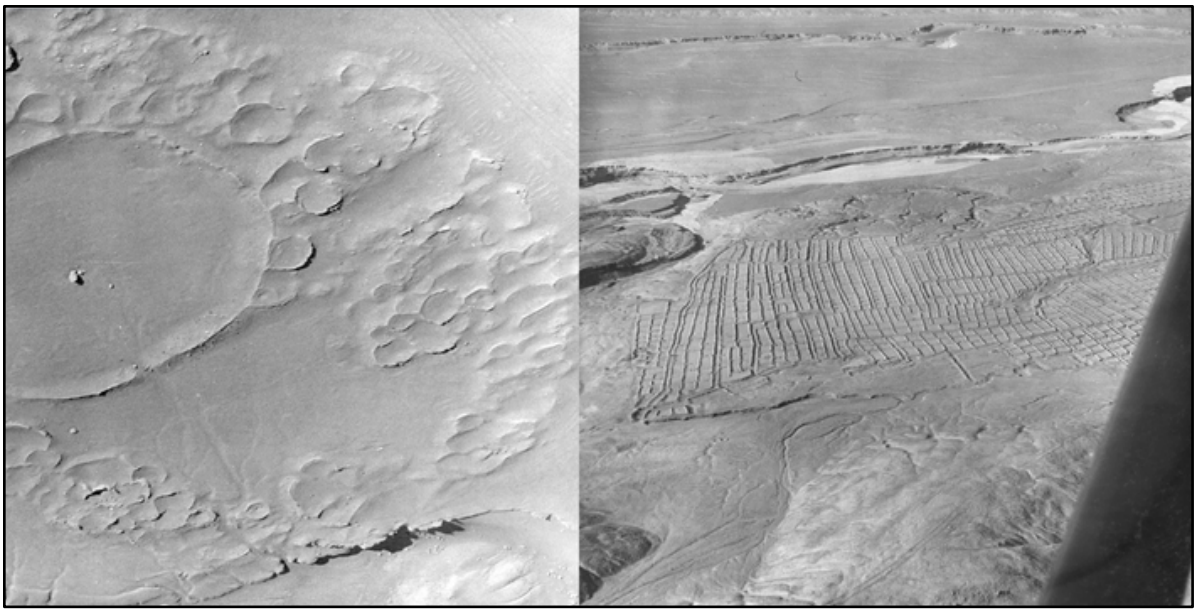

Figure 1. 1. A spectacular view. Aerial photographs of Guatacondo-1 and neighboring agricultural fields, taken by Emil de Bruyne in 1963. From the MNHN digital archive.

De Bruyne and his friend Hamilton rented a plane in Calama, some 300 kms south of Guatacondo, and about an hour and a half later spotted the ruins "in the middle of the most sterile and desolate desert" they had seen (de Bruyne 1963:2). Upon the discovery, de Bruyne reported the sighting to Dr. Grete Mostny, an Austrian archaeologist who headed the Anthropology Section at the National Museum of Natural History (MNHN) in Santiago. In a subsequent overland trip to collect material to send back to Mostny at the MNHM, de Bruyne described extensive cultivation fields, irrigation canals, and a cemetery. The place was, as he wrote, "in a virginal state", its excellent state of preservation making it an even more desirable site for scientific exploration.

While de Bruyne was the first to describe the ruins, it was Dr. Grete Mostny who wrote most extensively about the site. Born in Austria in 1914, Mostny left the country in 1939 to

escape the Nazis. She studied Egyptology and prehistory at the University of Vienna and began working at the MNHN as head of the Anthropology section shortly after her arrival, becoming the museum's director in 1964 (Aldunate and Durán 1989). Mostny was the first one to describe the area in archaeological terms, characterizing the occupation of the valley as a group of "urban sites of similar nature, ancient, cultivated fields with irrigation canals, petroglyphs stylistically related, pottery of a well-defined type, and homogeneous lithic material associated with the ceramics" (Mostny 1980:91). Mostny was also the first to associate these settlements and their occupants with a thorough knowledge of technologies such as metallurgy, pottery, and agriculture (Mostny and Niemeyer 1963). She argued that the archaeological record of Guatacondo represented a period of "incipient agriculture" and displayed architectural features consistent with other sites outside of Chile on pre-agricultural and early agricultural levels (Mostny 1980:96). These findings effectively associated this archaeological discovery with what was known continentally as the Formative period. However, Mostny noted, the absence of external elements from neighboring regions indicated that these settlements represented a relatively independent and autonomous cultural group.

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This chapter offers a brief intellectual history that weaves together stories of explorations of the Atacama with the broader ideological components that animated them, namely, the projects of modernity and empire. Through a discussion of museum operations and extractivist

enterprises in the region, I describe how the Atacama became a modern space while archaeology itself was emerging as a field of knowledge and practice through scientific explorations, industrial endeavors, and nation-building projects. In particular, I highlight the connections between "discoveries", such as de Bruyne's, and attempts to actualize the project of Western imperialism as part of efforts to consolidate newly independent nation-states in the southern Andes, with its ideologies of progress and economic development through capitalist extraction.

In what follows, I outline two thematic fields whose intellectual concerns and legacies continue to animate archaeological studies of the pre-Hispanic past, and the history of the Atacama, specifically: European colonialism and American globalism. These fields have shaped our ideas of the Atacama's history by turning it respectively into an object to be studied, preserved, and displayed, and by conceiving it as the quintessential space of nature, one that needs to be domesticated in order to be civilized. I argue that these imaginaries have shaped the kind of history writing that archaeology produces in two ways: first, by making the Andean north a site of antiquity and cultural heritage, thus characterizing the desert as a site of *origins*; and second, by imagining the desert as a place of extremes, a frontier between the "civilized" and the "not yet civilized"—effectively a tension between nature and culture—that turns its history into one of *progress* through techno-economic development. Specifically, I examine agriculturalization as a civilizational trope situated at one end of a universal path to more elevated orders of complexity. Through the case-study of the Guatacondo Valley settlements, I explore how the agricultural village operates as a North Atlantic fiction[2], reinforcing universalizing narratives of progress. In doing so, I propose instead a different material and

[2] Trouillot (1991) defines these fictions as words that project unique North Atlantic experiences on a universal scale.

interpretive approach to the architectural remains of early settlements, one that can open new avenues for thinking about (pre)history by re-territorializing narratives about the past.

"The conquest of nature" refers to the formation of empirical science and describes how the civilizational story of the West gets mapped onto other histories, particularly histories of human origins. Through the work of traveling, collecting, and describing, the Americas were transformed into the Nature to Europe's culture, its jungles, deserts, mountains, a scene where an overwhelming display of the non-human world existed, virginal, vast, and unexplored. By distilling the legacies of these scientific and extractivist endeavors, my aim is to make visible certain forgotten connections that might help us recast traditional tropes and "reclaim archaeology", moving beyond a modern(ist) gaze (Haber 2012, 2016; Gnecco 1999, 2015; González-Ruibal 2015). If, based on the Cartesian orders of science, "origins" and "complexity" are the issues that have long motivated investigations about the past in the Atacama, what kind of history writing can be produced by revisiting the intellectual lineages that created these fields of inquiry in the first place?

## On museums, nations, and archaeological explorations

The history of Chilean archaeology has been written around numerous "father figures", but nearly always begins with Max Uhle (Cornejo 1997; Dauelsberg 1995; Orellana 1996; Thomas 1977; Troncoso et al. 2008). When the German scholar arrived in Chile in 1911, he had spent about 15 years working in Perú, Bolivia, and Argentina. Uhle first came to Buenos Aires in 1892 with the purpose of studying, *in situ*, modes of diffusion of the Inca culture (Hampe Martínez 1998). Working at the Berlin Museum *für Völkerkunde* (BME) under the direction of Adolf Bastian, he had become acquainted with Inca history after part of the Centeno Collection,

one of Cuzco's finest and most impressive cabinets of curiosities, was acquired by the Museum in 1887 and travelled to South America as a museum agent to increase its collection (Gänger 2014; Rowe 1998). At the time of his move to Chile, Uhle was already well-acquainted with the prehistory of the Andes, having worked at sites like Pachacamac, Chanchán, Ancón, Supe, and in the valleys of Moche, Ica, Chincha, and Chancay in Perú. This work made him one of the most prominent Americanists of the time, and the undisputed "father of Andean archaeology" (Gänger 2006; Hampe Martínez 1998:161; Rowe 2011). After working for the BME, Penn Museum (1895-1898), and under the patronage of Phoebe Hearst to supply her own museum in California with archaeological collections, Uhle became the director of the Museum of National History in Lima from 1906 to 1911 (Gänger 2006). His move to Chile was probably arranged during the XVII International Congress of Americanists, celebrated in May of 1910 in Buenos Aires, which was attended by a large delegation of Chilean historians and ethnographers (including Rodolfo Lenz, Tomás Guevara, José Toribio Medina, and Aureliano Oyarzún, among others) who had a vocal admiration for the German academy (Pavez 2015). Shortly after, Uhle settled in Chile, hired by the Chilean government to lead the new section of Ethnology and Anthropology of the National Historical Museum.

Max Uhle's arrival often marks the beginning of a period of professionalization of the discipline in Chile (Cornejo 1997; Orellana 1996; Troncoso et al. 2011; Pavez 2015). He created the first historical-cultural sequence for northern Chile, including the Atacama Desert and its coast[3]. Uhle's fieldwork in Chile was intense in scale and volume; he recovered more than 3,800

[3] His biographer, John Rowe, points out that it was in fact Uhle who created the first chronological sequence for the Americas based on his work in Perú and Bolivia, between 1892 and 1908 (Rowe 1998).

pieces from the towns of Calama and Pisagua alone, over 400 skulls of "Indians of extinct races" and more than 50 mummies as part of the nascent museum (Gusinde 1916)[4].

Steeped in German *kultur* through his work under Bastian, Uhle's interests can be traced back to Herder's Counter-Enlightenment stance, which responded to the universalizing tendencies of French philosophy by foregrounding the particularities of each national and ethnic entity (Bunzl and Penny 2003). Uhle's preoccupation with questions of ethnicity and chronology was aligned with a search for national ancestry: in Bolivia, he insisted on the value of Tiwanaku ruins (Uhle 1943); in Perú, after his excavations at Pachacamac, he confirmed the existence of pre-Inca civilizations who were also able to create monumental buildings (Uhle 1991 [1903]); and in Chile, he foregrounded the importance local cultures, such as the "Chincha-Atacameño" and the "Arica aborigines", contextualizing them within continental and global cultural phenomena (Uhle 1922). More importantly for the Chilean context, Uhle recognized the chronological depth of the Atacameños: "The Atacama Desert and the northern region of Chile all the way to Arica, in addition to the Puna de Atacama, now belonging to Argentina, were inhabited since ancient times by a frugal race, the Atacameños; a few of them survive today around the Atacama salt flat, who still know how to speak the old tongue" (Uhle 1913:105, translation my own). Based on previous studies by van Tschudi, Alcides D'Orbigny, and Eric Boman, he agreed that, along with the coastal Changos and the Uros of the highlands, the Atacameños were groups of a special kind, different from the Andean type and, judging by their cultural traits, of an older origin (Uhle 1922). This came to confirm what Chilean historians, like

[4] His skills as a collectionist were certainly noted by Phoebe Hearst. Through her financial support of Uhle's expedition to Perú, her museum acquired more than 9,500 archaeological objects from ancient Perú, today part of "The Max Uhle Ancient Andean Collection". https://hearstmuseum.berkeley.edu/collection/phoebe-hearst-collections/

José Toribio Medina, had already hypothesized: that the cultural influence of the Incas, once considered a civilizational force in South America, had been culturally and chronologically limited—and that national ancestry was to be found in local cultures that preceded them.

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The background of this seemingly prolific traffic of ideas and objects was, of course, far more complicated, and it exemplifies the political dimensions of these archaeological endeavors. Almost 30 years prior to Uhle's arrival, the War of the Pacific (1879-1883), an armed conflict for saltpeter mining that pitted Perú and Bolivia against Chile, produced a geopolitical reconfiguration of the Andean nations that permanently landlocked Bolivia, and meant for Chile an expansion of over 100,000 $km^2$, including the Atacama Desert and its abundant mineral resources. The appropriation of the incredibly profitable Tarapacá and Atacama provinces, from the coast to the Andes, was followed by a compulsive campaign of "chilenization" to integrate the population of these regions into the Chilean nation-state, which was achieved through the introduction of nationalist symbols and disciplinary institutions (González 1995, 2002). At the onset of the 20th century in Tarapacá and in the 1930's in the interior valleys, public schools, in particular, functioned as formal institutions that facilitated the erasure of a Peruvian or Bolivian past: "alfabetizadores" taught children how to read and write in Spanish, they learned the national anthem, celebrated Chilean festivities, and read about the heroes of the war (González 1995). During this period, the state explicitly denied the existence of indigenous subjects,

rendering them instead as peasant communities whose members needed to be included in the national project as citizens[5].

This period also marked a time of archaeological discovery and expansion in the region. As Gänger (2009, 2005) has demonstrated, following the annexation of Tarapacá and Atacama, the Chilean government in Santiago launched archaeological expeditions in the mid-1880's (Phillipi) and again in the 1910's (Uhle) with the purpose of appropriating pre-Hispanic remains. The first expeditions, carried out during the War of the Pacific (1879-1883) were led by Rudolfo Philippi, then director of the Chilean National Museum (CNM), whose brother, Bernhard Philippi—a German naturalist, explorer, and colonization agent for the Chilean government—was at the time recruiting German immigrants for the settler colonial program in Mapuche lands at the southern border. Rudolfo traveled to South America in 1851 and first settled at his brother's estate in La Unión, in the Valdivia province of southern Chile—the epicenter of the project to colonize Mapuche lands with European immigrants (Bruna and Larrocau 2008).

Philippi sent a taxidermist to accompany Chilean troops on their way to Lima and ordered his students to collect objects of natural history as well as American antiquities (Philippi 1881 cited in Gänger 2009:695). Once the Chilean troops reached Lima in 1881, they looted the National Library and Museum, and some of the stolen objects were shipped back to the National Museum in Santiago where they became part of the Chilean national collection. Philippi himself had traveled to the Atacama province in the summer of 1853/1854 to conduct a scientific exploration (Philippi 2008[1860]). In 1884, the Chilean government organized the first scientific

[5] This denial of the "indio" lasts roughly until the 1990's, when the governments of the *Concertación de Partidos por la Democracia* made multiculturalism and cultural patrimony a central part of their national project of post-dictatorship modernization (Ayala 2007, 2008; Boccara and Ayala 2011; Vilches et al. 2015).

expedition after the official annexation of Tarapacá. It was led by Phillipi's son, Federico, a year after the war ended with the goal to document the paleontology, zoology, archaeology, and botany of the province (Gänger 2009). Federico succeeded his father in the direction of the Museum after his retirement in 1897. But in 1911, a few years after the end of the Philippis' tenure, CNM director Eduardo Moore wrote a letter urging the Secretary of Education to invest in the museum's Anthropology, Archaeology, and Ethnology department by hiring a specialist: "It is the only civilized nation", Moore wrote, "that lacks systematic, scientific approaches to establish a field of study of the races that have inhabited this territory" (Moore 1911:189, translation my own). Moore's request to fill in the blanks of Chile's ancient past was heard; Max Uhle was the person chosen to carry out that work.

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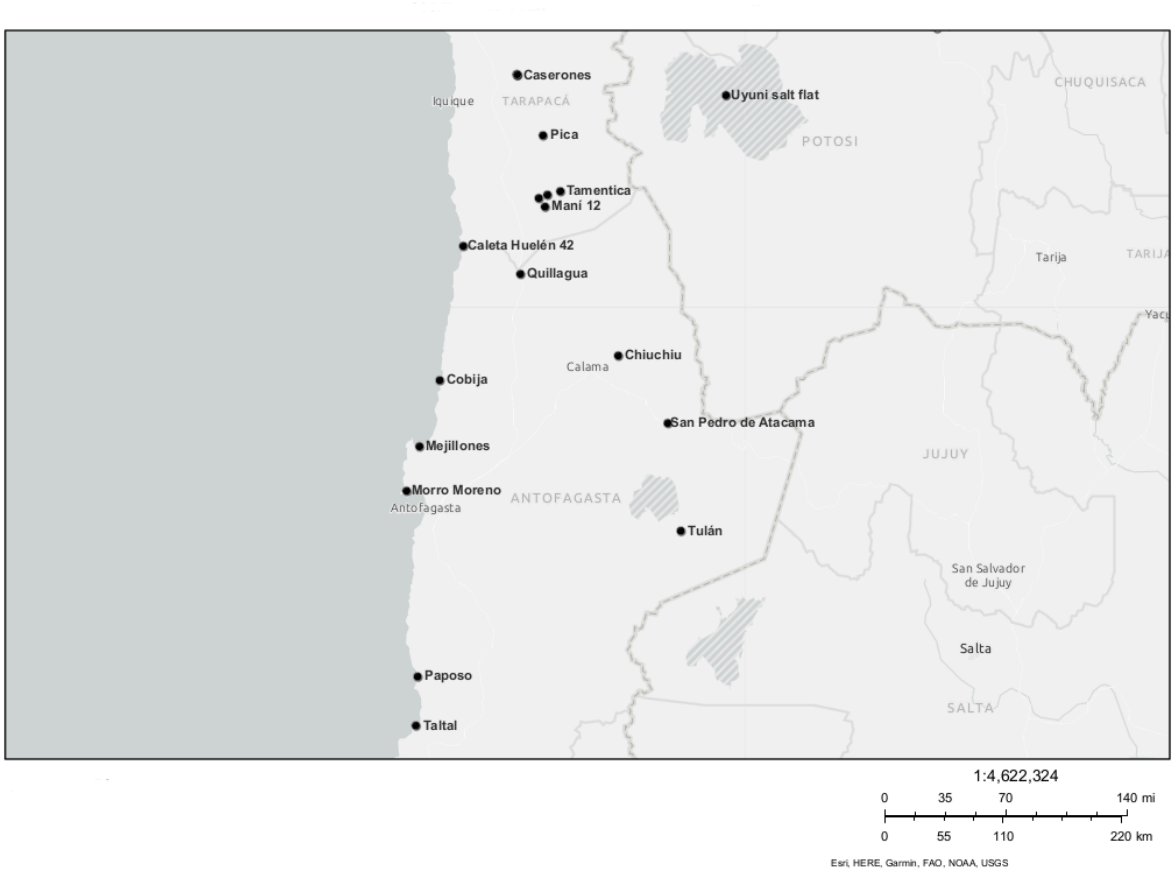

Figure 1. 2. Map of the region of study: Tarapacá and Antofagasta regions of northern Chile.

What motivated German ethnologists and archaeologists to explore South America, and particularly its prehispanic past, other than the colonialist drive that characterized European expansion? The German bourgeoisie of the late 1800's idealized humanist education and had great interest in languages and cultures of the Classic antiquity (Bunzl and Penny 2003; Gänger 2006, 2014; Pavez 2015; Trigger 2006; Zimmerman 1999). In public discourse, the preservation and protection of historical monuments was considered *Kultur betätigung,* activities that were part of this modern and educated ethos (Gingrich 2005; Stocking 1996; Zimmerman 2010). Starting in the 1850's, magazines that published travel literature or ethnographic accounts of far-away lands—such as *Globus* or *Das Ausland*—became widely popular and consumed by the educated elite, contributing to their growing fascination among Germans with cultural difference (Gänger 2006), as were printed images and paintings of South American landscapes (Figure 1.3). Alexander von Humboldt was often depicted engulfed or miniaturized by nature or by his own collection of American plant and animal specimens, highlighting the connection between the new continent and the primordial world of Nature (Pratt 1992). The quest to produce a rich ethnological archive and transform it into museum collections was an undertaking that motivated German academics to move to South America, Africa, and Asia. Indeed, by the end of the 19th century, Germany had deployed scientists and academics all over the world, who were tasked with o creating collections to fill up their regional museums (Bunzl and Penny 2003). The Ethnological Museum of Berlin (*Ethnologisches Museum)* was founded in 1873; by 1880, over 21,000 objects out of the 40,000 that were part of its collection came from the Americas (Fisher 2006).

Figure 1. 3. Der brasilianische Wald. Print made by J.M. Rugendas (1828). View of the Brazilian rainforest. In the center, a group of indigenous women (From the British Museum).

In the Atacama province in particular, numerous scientific missions were organized in the second half of the 19th century, which produced a "diaspora of objects" from different desert localities, such as Chiuchiu, Chuquicamata, and Calama, among others (Ballester 2020a; Ballester et al. 2019). In Chiuchiu alone, at least 27 people of eight different nationalities excavated cemeteries and collected objects between 1850 and 1970. Today, those objects are part

of collections in at least 18 cities spanning Europe, North America, and South America. The first record of an archaeological excavation in Chiuchiu, a small town located at the confluence of the Salado and Loa rivers, comes from a German-Chilean doctor, Aquinas Reid, who excavated a cemetery with 500 to 600 burials, took two mummy bundles with him and shipped them to a friend in the east Bavarian city of Regensburg, to be deposited in the Museum of the Zoological and Mineralogical Association (Ballester 2020b).

Although cosmopolitan in nature, German anthropology was simultaneously a provincial enterprise. This "worldly provincialism," according to Bunzl and Penny (2003:16), "had much to do with a stereotypical Western fascination for the 'primitive'; but it also reflected a particularly German craving for *Bildung* as the defining feature of respectable middle-class existence in and beyond the major urban centers". Indeed, municipal, or regional museums, rather than universities located in big metropoles, acted as the predominant institutional setting for the development of the discipline.[6] The romantic desire to *know* cultural difference led people like Wilhelm Reiss and Alphons Stübel, whose reports on excavations in Ancón landed in Uhle's hands while he was at the BME, to make the journey to South America as the young republics were building their own national histories. Discussing the intersection between the history of German anthropology and European colonial enterprises, historian Glenn Penny (2003:252-253), speaks to the specificity of this program: "ethnographic museums and anthropological societies predated the acquisition of colonies, and the vast majority of German's ethnological inquiry continued to take place outside the colonies they began to acquire after 1884. Largely because of this context, salvage anthropology (the frenzied effort among anthropologists to acquire as much

[6] As an example of this interest, Gänger (2006:74) notes that between 1868 and the First World War, ethnology museums opened in most German cities, including Munich, Hamburg, and Berlin.

material culture as possible from areas that they believed would soon succumb to the tide of colonial modernity) persisted among Germans through WWI."

In practice, the German study of cultural difference was expressed through a paternalism rooted in the firm belief of the superiority of German theories and methods. As Reiss and Stübel had expressed, it was only *their* work that was capable of salvaging what Peruvians themselves were purposefully destroying through ignorance and desire for financial gain (Gänger 2006:77-78). According to Gänger (2009, 2015), this intellectual stance was eventually transformed by Uhle into a paternalistic nationalism, uniting his work studying the pre-Hispanic past with the civilizing discourse of the German nation[7].

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Marisol de la Cadena (2006) has argued that in the Andes, archaeology became one of the first disciplines to bolster the discourse of nation-building by providing narratives that underscored a splendorous past as the path to civilization (see also Díaz-Andreu 2007; Hamilakis 2007; Kohl 1998; Papadopoulos 2005). Troncoso and collaborators (2008) note that the entrenchment of the Chilean nation-state went hand-in-hand with the formation of a legal system, represented by the constitutions of 1828 and 1833; with the creation of an apparatus of classification and order that allowed the disciplining of the social body (for example, the creation of the National Police in 1830, and the carceral system in 1843); and lastly, with the

[7] Gänger (2006) mentions that, in a letter addressed to Hitler in May of 1936, Uhle makes his commitment to a German nationalist project apparent, writing that he was going to continue working for the new *Reich* "for the illustrious ideals of German science, which now spreads around the world" (Uhle 1936 cited in Gänger 2006:81, translation my own).

establishment of a system of production and reproduction of knowledge that made education and instruction possible for all citizens. The conjunction of national-building strategies and commitments to educate the general populace is reflected in the founding of the National Library in 1813, the University of Chile in 1842, and the passing of the Law of Primary Instruction in 1860. The *Museo de Etnología y Antropología*, created in 1912, and the proclamation of the law that created the National Council of Monuments (CMN) in 1925, also express a growing nationalist interest in knowing the pre-Hispanic past. These transformations were, in fact, punctuated by the aforementioned war, but also by the protracted military effort to seize Mapuche lands in the southern border that resulted in the settler-colonialist project known euphemistically as the "Pacificación de la Araucanía" (Bengoa 2002; Boccara and Seguel-Boccara 2005; Foerster 2008).

Sociologist Jorge Pavez (2015), working with ethnographic archives produced in Chile, has made this connection even more explicit. The tradition of German ethnology (*Volkerkunde*) offered what the Chilean project needed: to overcome the Catholic Hispanicism of the earlier writers of ancient history, secularizing it; and to reproduce through scientific means a particular form of national identity that differed from the enlightened French liberalism of creole elites. Indeed, as Pavez writes, German anthropology was characterized by a dual commitment to inductive science—an empirical methodology centered on gathering information before theorizing claims—and to the Herderian concept of *Volkgeist*, or the "spirit of the people"—a romantic form of nationalism in which the state derives its political legitimacy from historic ethnic or cultural groups. Pavez describes the influence of *Volkerkunde* and *Volkgeist* in the configuration of anthropology as a discipline in Chile more broadly, and in the creation of anthropological archives of indigenous groups that lived within the borders of the new republic.

Moreover, as Spanish colonies began opening their territories to other European powers, German anthropology played a key role in their colonizing operations. As German scientists circulated throughout South America, their purported apolitical and objective science was in fact serving numerous political agendas (Penny 2003).

In this context, archaeology operated as a "tool for conquest" (Gänger 2009:698), supplying a powerful discourse for the symbolic appropriation of new spaces. The museum, as a *dispositif* for the display of a unified national historical imaginary. This intellectual history is defining for the project of archaeology in northern Chile. The lasting legacies of German influence are not only expressed in the lingering preoccupation with ascribing material culture to particular periods and ethnicities, but also in the continuing aspiration to study, preserve, and disseminate the knowledge of the pre-Hispanic past through institutional channels (Ayala 2007; Gänger 2009; Pavez 2015; Vilches et al. 2015). Similarly, archaeology was deployed as part of the disciplinary apparatus that the new republics mobilized for the occupation of indigenous lands. This "republican colonialism", as Pavez (2015) has named it, was tasked with producing hegemonic knowledge about colonized societies, instituting a highly centralized discipline that has been historically unfair in acknowledging the importance of regional study centers (Ballester 2020; Seguel 2020), while generally disavowing indigenous forms of knowledge production.

**Projecting global expansion: Archaeology and the making of nature in the Atacama**

Uhle was but one European in a long list of travelers to reach the Atacama in the early 20th century, captivated by its history and landscape. According to Salomon (1985), the history of explorations in the Andes begins with a period of conquerors who fed Europe's hunger for reports about new lands through "soldierly" chronicles—like the Pizarro brothers or Cieza de

León—but also through a colonial administration that produced an array of bureaucratic records, known as "visitas."[8] It is in this context that we find the earliest European description of the people of the Atacama Desert, provided by Gerónimo de Bibar (1966[1558]), a young soldier accompanying Pedro de Valdivia in his expedition to Chile. In his "Crónica y relación copiosa y verdadera del reyno de Chile" Bibar makes reference to the people living in the "Atacama valley" (now San Pedro de Atacama):

> "These people served the Inca; they are willing and well-dressed people like those of Perú. The women are good-looking; their habit is a wide gown that covers the arms to the elbows and the skirt to below the knee. They have their adoratories and ceremonies like those of Perú, incited by the devil, and those who give themselves to him as friends are used to speaking with him. They are accustomed to naming the children that are born. Women pride themselves on wearing long black hair, and so do men. The weapons that are used are arrows and slings" (Bibar 1558:14, translation my own).

These early accounts combine tales of conquest with some anecdotal ethnographic observations, blurring the boundaries between fact and fiction. As the pair travels south, the storyline combines Bibar's tales of heroism with passing descriptions about the people he and de Valdivia encounter. Trouillot (1991:24) makes reference to these accounts as literary genres that antecede anthropological discourses. The claim that we can distinguish between genres like travelers' accounts, colonial surveys, ethnographic reports, and fictional utopias is in itself a disciplinary move, a foundational act that creates the field(s) of knowledge that make anthropology possible: "In the early sixteenth century, European descriptions of an alleged state of nature in the realist mode filled the writings of colonial officers concerned with the immediate management of the Other. The realist mode also pervaded travelers' accounts of the sixteenth

[8] *Visitas* were reports produced through direct inspection of Andean territories. There were two types: "specific", and "general", with the latter encompassing a much larger jurisdiction (such as Toledo's inspection of Perú in the 1570's). They were generally secret, and the inspector (*visitador*) gathered information (intellectual, religious, administrative, demographic, fiscal) about local conditions to report back to the king and the Council of the Indies (Cook 2008).

and seventeenth centuries, before settling in the privileged space of learned discourse with eighteenth-century philosophers and the nineteenth-century rise of armchair anthropology".

The mid-colonial years (1590-1660) saw the proliferation of linguistic works, among them Diego González de Holguín's (1608) "Vocabulario de la lengua general de todo el Perú llamada lengua Qquichua, o del Inca", and Ludovico Bertonio's "Vocabulario de la lengua Aymara" (1613). Both sources have been mined for ethno-classifications relevant to Andean thought. This was also the period that produced the famed "Huarochirí Manuscript", the only example of an Andean mythology in its original language (Ávila and Arguedas 1966; Salomon and Urioste 1991). The following centuries (ca. 1700-1850) witnessed a significant increase in the production of literature through scientific expeditions. During this period, explorers, naturalists, geographers, and mathematicians devote space and time to the description of people and places (e.g., Feuillée 1725; Frézier 1732; Malaspina et al. 2001 [1789-94]; La Condamine 1745). Reports by pirates and merchants[9] in the 16th and 17th centuries give way to journals written by "philosophical travelers" (Cañizares-Esguerra 2008:291) that followed the French Geodesic Mission to the Viceroyalty of Perú, known as the La Condamine expedition in 1735—tasked with measuring the length of a degree of latitude at the Equator (Goodman 1972). These romantic travelers of the 18th century, "wide-eyed polymaths" like Feuillée, Frézier, and Malaspina, mutate in the 19th century into the "more specialized linguist, archaeologist, or naturalist who, more often than not, is of Germanic origin" (Cañizares-Esguerra 2008:292), epitomized by Alexander von Humboldt. Pratt (1992) describes Humboldt as a naturalist with "imperial eyes", whose writings actively sought to reinvent Latin America as primordial nature,

[9] For the coast of the Atacama, Ballester and Gallardo (2011) mention two relevant examples: the case of Vincent Bauer, a French merchant who provided descriptions of the coast when he landed in Cobija in the early 17th century. And the pirate, explorer, and slave-trader Francis Drake, who visited Morro Moreno (see Figure ABC) to take supplies, trading knives, beads, and other objects for fish.

just as the region was gaining its independence from Spain. This is a period of incidental ethnology, as Salomon (1985) has noted, producing travel-related writings that were often a blend of reports, letters, civic descriptions, and surveys, with tales of survival, strange encounters with monsters and marvels, medicinal treatises, and myths. Travel literature, in particular, illustrates the significant ways in which Europe's relationship with the rest of the world was changing (see Cañizares-Esguerra 2001; Greenblatt 1991; Pratt 1992; Spurr 1993; Trouillot 2003). The production of specialized texts demonstrates the extent to which science came to articulate Europe's contacts with imperial frontiers and explains why international scientific expeditions became one of its "most conspicuous instruments of expansion" (Pratt 1992:23).

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But until the beginning of the 19th century, most explorations of the Atacama had not ventured to the desert's interiors, staying mainly on the coastal plateau (Table X) (Figures ABD and DEF). It was not until the 1850's that more specialized expeditions began describing and mapping the territories that lay beyond the Coastal cordillera[10]. In 1826, British engineer William Bollaert travelled to the Tarapacá province under the auspices of the Peruvian government, to conduct a mining survey of the region while working at the silver mine of Huantajaya (Bollaert 1851). His observations were later read before the Royal Geographical Society of London, one of the earliest moments in the internationalization of Andean studies

[10] One exception to this general tendency is Antonio O'Brien's map of Pampa Iluga, on the mouth of the Tarapacá valley, in 1765. A copy of the map is available online through the Biblioteca Nacional Digital de Chile (BDC): http://www.bibliotecanacionaldigital.gob.cl/bnd/631/w3-article-334184.html.

(Salomon 1985). Of Tarapacá, Bollaert writes that it is “the most distant and extensive province of the empire of Perú, and so uninhabited and without means of cultivation that it was almost disregarded by the discoverers” (Bollaert 1851:102).

During his trip to Tarapacá, Bollaert made a detailed map of the region, recording roads and caravan trails, the main mining operations, and areas with potential exploitable resources, particularly of the nitrate deposits of the pampa. His publications also offer historical and ethnographic observations of interior towns. “The Pampa del Tamarugal”, he writes, “contains sufficient nitrate for the consumption of Europe for ages; the desert of Atacama yields it” (1851:115). Bollaert’s work shows how extractivism drove these expeditions and geographical explorations. As the desert was being opened up for knowledge, it was simultaneously presented as an under-explored territory, full of economic potential. Cartographic knowledge flourished during this period, with exhaustive regional maps being produced every decade after Bollaert’s map was published, moving away from a view from the coast (Figures 1.4 and 1.5). Following his South American travels, Bollaert planned to carry out a similar endeavor in the East Coast of Africa with the assistance of the British government and the Royal Geographical Society but was never able to carry out his Old-World expedition (Forbes 1877).

| Expedition | Date | Purpose | Origin/Sponsor | Geography |
|---|---|---|---|---|
| Louis Feuillée (Astronomer, physicist, botanist, Franciscan priest) | 1707-1712 | Scientific exploration | French | Coast |
| Amédée-François Frézier (Military engineer, mathematician, explorer, spy) | 1712-1714 | Reconnaissance mission of ports and fortifications on the coast of South America | French | Coast |
| Antonio O'Brien (cartographer, metal worker) | 1750's | Geographical exploration | Spanish | Interior |
| Malaspina (Naval officer) | 1789-1794 | Political and scientific exploration (geomorphological, zoological, astronomical, social observations) | Spanish | Coast |
| Von Humboldt (Naturalist, philosopher, mining engineer) and Aimé Bonpland (botanist) | 1799-1804 | Scientific exploration of the Spanish possessions in the Americas (natural history, geography, climate, society ) | Spanish | Coast |
| Fitz Roy and Darwin (Naturalist) | 1831 | Survey and mapping of the coast of South America | British | Coast |
| William Bollaert (Engineer, chemist) | 1851 | Mining survey of the Tarapacá province | Government of Perú | Interior |
| R. Philippi (Naturalist) | 1853-54 | Scientific exploration (geomorphology, zoology, ethnology of Atacama) | Government of Chile | Interior |
| André Bresson (Railway engineer) | 1870 | Geographical exploration | Private/Government of Bolivia | Interior |
| Créqui-Montfort and Sénéchal de la Grange | 1903 | Scientific exploration (geological, mineralogical, philological, ethnological) | French | Interior |
| Isaiah Bowman (Geographer) | 1913 | Geographical exploration | Private/Yale University | Interior |

Table 1. 1. Details of some of the expeditions mentioned in the chapter.

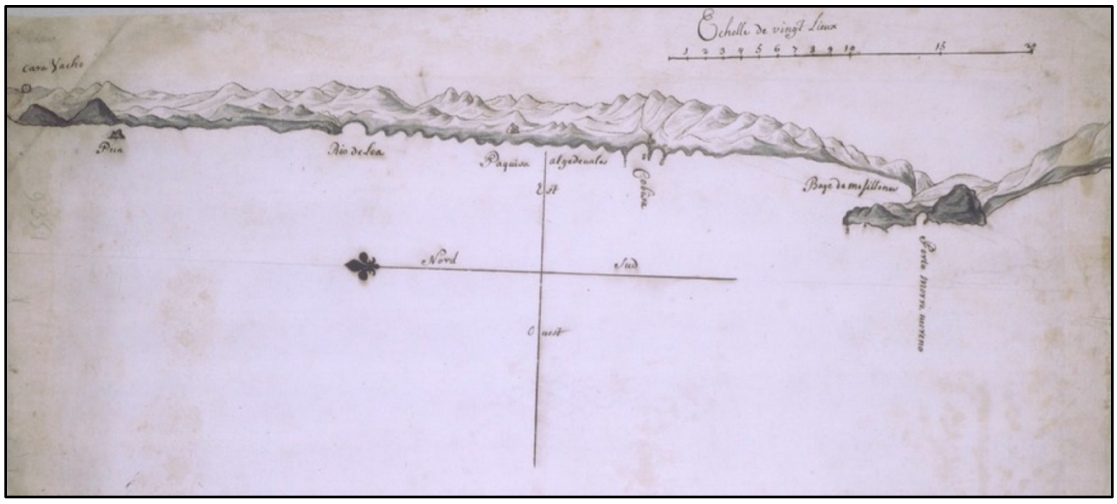


Figure 1. 4. View from the Pacific Ocean into the coast of Atacama (1700-1799). From left to right: Río Loa, Paquica, Algodonales, Cobija, Bahía de Mejillones, Morro Moreno (From Ballester and San Francisco 2017:116).

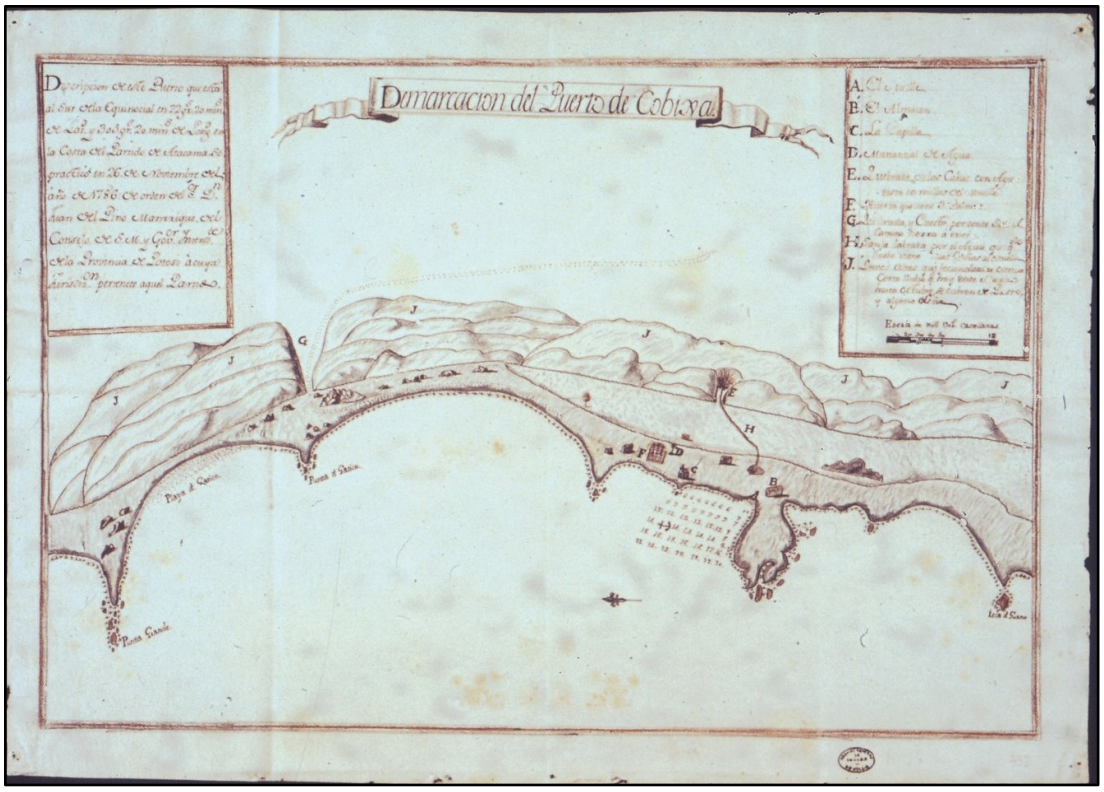


Figure 1. 5. View from the ocean looking into the Roadstead of Cobija, made by Juan del Pino Manríquez in 1786. Only the littoral plateau and the Coastal Range are visible (From Hidalgo 1983:145).

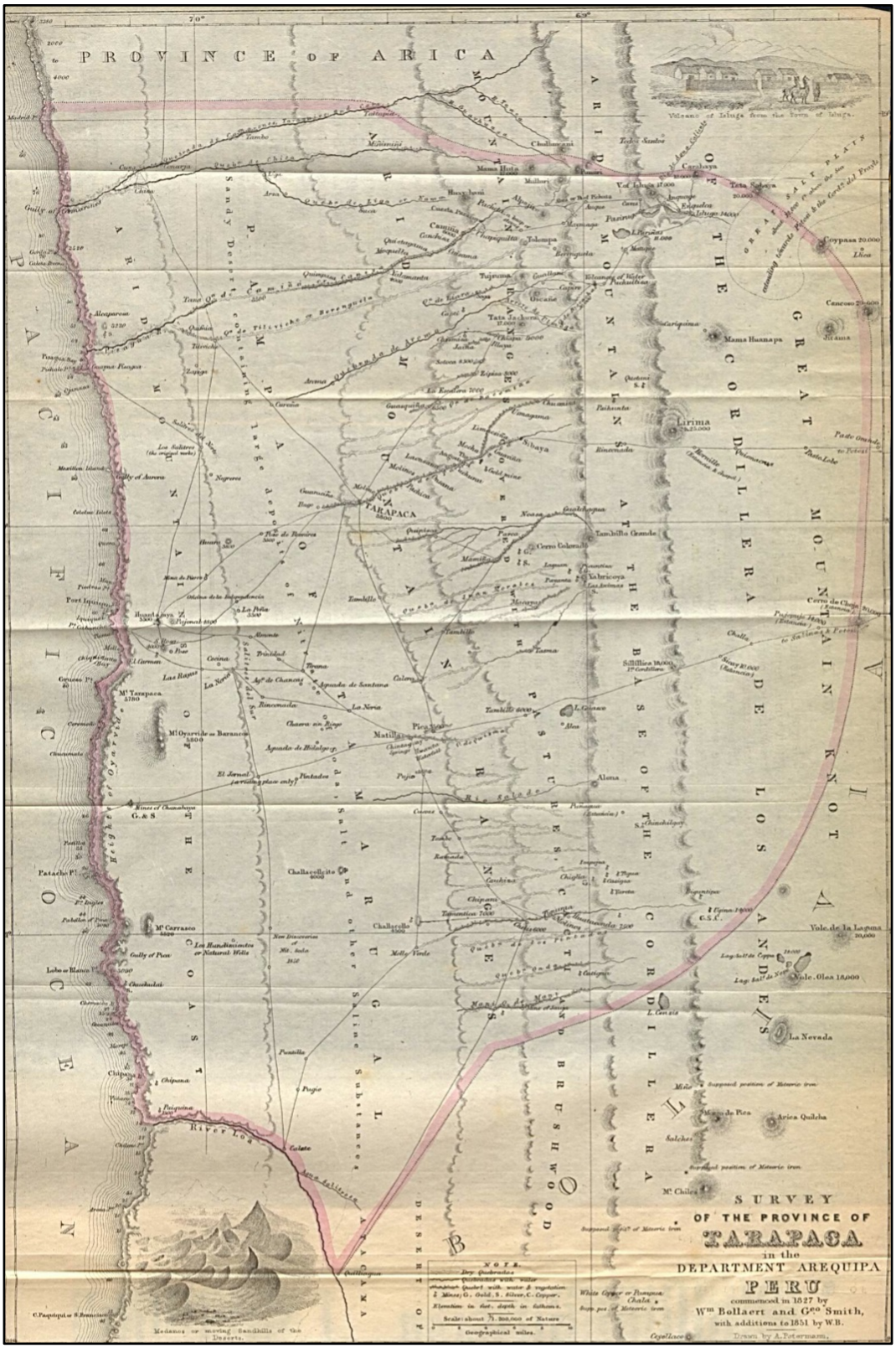


Figure 1. 6. Map of the Tarapacá province, made by William Bollaert (1851).

Mary Louise Pratt (1992) examines the ways in which travel accounts and scientific expeditions contributed to the self-fashioning of European audiences, arguing that this "turn to the interiors" was significant in the history of science because it gave rise to a new version of Europe's "planetary consciousness". Pratt explores the significance of two events that took place in 1735: the publication of Linnaeus' "The System of Nature" and the launching of Europe's first major international scientific expedition, La Condamine's French Geodesic Mission to the Equator. Together, these events illustrate the emerging understanding the European elites had of themselves vis-a-vis the rest of the world. Aboard La Condamine's expedition were mathematicians, geographers, and naturalists tasked with measuring, describing, and classifying new life forms and territories. The expedition combined the practices of circumnavigating the globe and cartography to produce order out of chaos, a totalizing embrace that started to fill up the blank spaces left by old navigational maps. Together, Linnaeus' system of classification and scientific expeditions fused an orientation toward interior exploration with the construction of universal meaning through the descriptive mechanisms of natural history. These historical events opened the possibility of thinking about a "world history", a new totality that became tangible as science mapped and described all corners of the globe.

La Condamine published extensively after his return to France, where his reports on quinine produced by the *Cinchona officinalis* in the Peruvian Amazon and the "balms, and sticky oils" that oozed from trees, marked the beginning of the industrial histories of malarial drugs and rubber (La Condamine et al. 1747). Simultaneously, the visualization of entire new territories paved the way for the later penetration of capital and extractivisms into territories that had been, until then, closed off to other European nations besides Spain and Portugal. For Pratt (1992:36),

the "systematizing of nature [...] models the extractive, transformative character of industrial capitalism, and the ordering mechanisms that were beginning to shape urban mass society in Europe under bourgeois hegemony. As an ideological construct, it makes a picture of the planet appropriated and redeployed from a unified, European perspective". The systematic mapping of the globe was a new kind of knowledge-building endeavor that correlated with the expanding search for potentially exploitable resources, new commercial routes and markets, and new lands to colonize. Pratt argues that commercial and scientific interests were purposefully kept separate: for example, Cook's expedition to the South Seas was mounted in the name of science, yet it went under secret orders to look out for commercial opportunities. Similarly, as part of La Condamine's expedition, Spanish geographers and naval officers Jorge Juan and Antonio de Ulloa, provided detailed ethnological descriptions while also preparing a secret document of political reflections for the Bourbons in Spain, reporting on the deterioration of their South American realms (Salomon 1985). Both were members of the *Guardias Marinas*, a military institution for young noblemen who were schooled in astronomy, mathematics, and navigation (Goodman 1972).

But under the universal(izing) language of natural history, Latin, and the figure of the benign naturalist, curiosity did not seem to pose any danger: "Here is to be found a Utopian image of a European bourgeois subject simultaneously innocent and imperial, asserting a harmless hegemonic vision that installs no apparatus of domination" (Pratt 1992:33). It is this politics of vision that Donna Haraway (1988:581) equates with the "unmarked positions of Man and White", the disembodied, all-seeing eye that represents the view from nowhere, making claims to objectivity while simultaneously serving colonialism and capitalist extraction. Such claims relied on an understanding of natural history as operating under the guise of scientific *and*

political impartiality: “One by one the planet’s life forms were to be drawn out of the tangled threads of their life surroundings and rewoven into European-based patterns of global unity and order. The (lettered, male, European) eye that held the system could familiarize (‘naturalize’) new sites/sights immediately upon contact, by incorporating them into the language of the system” (Pratt 1992:31). It is no coincidence that these expeditions and their processes of naturalization and incorporation by Europeans are occurring at the height of the slave trade, the plantation system, colonial genocide in North America and South Africa, and slave rebellions in the Caribbean, North America, and the Andes. As other authors have noted, science becomes an agent of colonialism and empire insofar as it operates as an allegedly neutral taxonomic arrangement that serves to justify the “civilizing mission” of the West (Copper and Stoler 1997).

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By the turn of the 20th century, another symbolic field shaping discourses about the Atacama began to emerge. The nitrate and copper rushes brought industrial entrepreneurs, experts, and foreign capital into the desert[11], accompanied by the geologist, prospector (*cateador*), or mining engineer-turned-amateur archaeologist as a figure that epitomizes this process. These are the true “pioneers” of the desert (Bruna and Larroucau 2008: xxiii). When Rudolfo Philippi travelled to the Atacama in 1854, he was accompanied by Diego de Almeyda and José Antonio Moreno, two *cateadores* with expert knowledge of the region. Born in Copiapó around 1770, Almeyda worked as a provisionist of military ships in Valparaíso, but always had

[11] De Onis 1966. *New Copper prices start Rush in Chile.* https://www.nytimes.com/1966/05/29/archives/new-copper-prices-start-rush-in-chile-new-copper-prices-touch-off-a.html

plans to become a miner. He crossed the *Despoblado de Atacama* twice, from Copiapó to San Pedro de Atacama, hoping to find the mineral fields that would turn him into a rich man (Bruna and Larroucau 2008; Phillipi 2008[1860]). Moreno (1812-1869) was an expert *cateador* and knew the coast of the Atacama, between Chañaral and Mejillones, very well, using the cove of *Hueso Parado* near Taltal as a shipping port for transporting minerals to European markets (Bruna and Larroucau 2008). Taltal was one of the sites where amateur archaeologist and customs agent Augusto Capdeville made his unique archaeological findings between 1913 and 1923, including evidence of a "Paleolithic group" in coastal South America (Ballester 2009; Capdeville 1921, 1928, 1930; Latcham 1915, 1939; Uhle 1923). Capdeville maintained a regular epistolary exchange with Max Uhle (Mostny 1964), who heavily influenced the interpretations of his findings.

During this period of renewed mining interests (and following the silver and nitrate booms of the 18th and 19th centuries), anthropology in the Andes meant almost exclusively the study of antiquities (Salomon 1985), and the Atacama Desert was no exception. When American geographer Isaiah Bowman traveled to the Atacama Desert in 1913, it was his third expedition to South America under the auspice of Yale University and the American Geographical Society. Bowman participated in Hiram Bingham's expedition that resulted in the "discovery" of Machu Picchu, the "Lost City of the Incas" (Bingham 1948) in 1911. Self-described as a "geographical explorer", he eventually became a savvy political geographer who served as an advisor for the US State Department under the Wilson administration, then to Franklin D. Roosevelt, and later became the first director of the American Geographical Society. Bowman was born in 1878 in Ontario, Canada, to a family of Swiss Mennonites who moved to a farm in Michigan soon after his birth. He grew up reading books about explorations, like Stanley's "In Darkest Africa", and

"Captain Cook's Voyages", becoming a schoolteacher before attending Harvard in the fall of 1902 (Smith 2003).

Bowman opens his 1924 book about the journey, "Desert Trails of Atacama" with a bucolic vision of desert towns: "From the desert trail, long, hot, and deep in dust, their inviting gardens are seen many leagues away, and at night a tower of light in a commanding hilltop guiders the traveler to their hospitable gates" (1924: i) This vision contrasts with the one he offers about desert dwellers, whose characters were shaped by the intensity of their surroundings: "Four centuries, and at the end of them a railway, have not altered the *essential pioneer quality* of the life of desert communities like Calama and Copiapó; and to an even greater degree this is true of San Pedro de Atacama, Pica, Matilla, and Quillagua" (Bowman 1924:8. Emphasis added). At the time he was writing, the main concern of geography, already distinguished from geology, was human interactions in the physical environment (Smith 2003). That the desert was a place of extremes made it a perfect geographical laboratory, where one could understand how nature, climate, mountain chains, and water affected the lives of the people who inhabited such severe surroundings. Bowman was amazed that, although industry had made its way into the desert—mining operations were thriving and new railroads connected towns and ports, creating cosmopolitan enclaves—the isolated villages of the interior "follow the old callings and ways of life". Echoing von Humboldt, Bowman (1924:8) writes: "The historian Buckle was measurably right...when he entertained the view that the backwardness of South American was due to the fact that man was there overburdened by nature as upon no other continent".

In "Desert Trails", he frequently describes the desert as a frontier, no doubt informed by the intellectual legacies of American historiography: only two decades prior to Bowman's journeys, during the World Columbian Exposition of 1893 in Chicago, historian Frederick

Jackson Turner famously declared the end of the American frontier. The proclamation acknowledged the importance of this "area of free land", receding with "the advance of American settlement westward", in shaping US institutions and in the development of a truly American character (Turner 1893:1). With wild country, unsettled lands, and unruly territories gone—effectively colonized—Turner saw the end of an era in American history. Yet, Bowman (1924:1) seems to have been challenging Turner when he talks about the motivations for his journeys to South America:

> "It has become fashion to say that major exploration is at an end because the North Pole and the South Pole have been attained and the general design of the mountains, deserts, and drainage systems of the earth has become known. Yet in truth the map is still crowded with scientific mysteries though its great historic mysteries have been swept away."

Bowman's fascination with the desert rested on the belief that this landscape—which he characterized as perplexing and enigmatic, much like the Great West had been—was one of the last pockets of absolute space yet undiscovered by Westerners. Often excluded from Chile's archaeological history Bowman's presence and interest in South America sheds light on the broader program of Euro-American capitalism, informing how the Andean north was effectively incorporated into Chilean imaginaries. One of Bowman's biographers, Neil Smith (2003: xviii), puts him at the center of a new architecture of empire: U.S. globalism, "built on a strategic recalibration of geography with economics, a new orchestration of world geography in the pursuit of economic accumulation." Indeed, Bowman's life and work coincided with the dramatic geopolitical shift of the early 20th century: the decline of European empires and the emergence of a different kind of planetary project, a world ruled by the laws of the market rather than direct political and military force. With this shift, and the rise of American empire, came

new ways of imagining the historical past in this part of the Andes. If German anthropology opened up the desert for academic exploration and scientific knowledge production at the height of European colonialism, U.S. globalism (both in theory and practice)—represented by figures like Bowman, de Bruyne, and countless others—helped shape the spatial and temporal imaginaries of the past in the Andean north. Under the conditions created by the impartial naturalist, colonial capitalism makes its way into the Atacama, hand-in-hand with the scientific specialists who served both public and private interests.

Archaeology as an epistemological project is tied to these intellectual linkages. The production of scientific knowledge, first through travel writing, then through expeditions of natural history, and lastly through the work of the specialist, effectively depicts South America as the primordial space of nature (Pratt 1992). This brief sketch of its disciplinary trajectory, beginning with cycles of violent disenfranchisement and dispossession, foregrounds certain concerns that continue to animate archaeological research. In the next section, I examine the history of what I call the "Neolithic/Formative paradigm", a concept that renders a particular vision of the world and projects it as a universal. The examination uncovers the spatial and temporal imaginaries that the paradigm creates, operating as what Trouillot (2003) has called "North Atlantic fictions". He describes these fictions as words, concepts, and visions of the world that renders a particular version and history of the world as universal. They do so by creating narratives that make seem universal what is in fact historically specific. And they do so through a series of mechanisms that make meanings proliferate, that "evoke rather than define". Terms such as "development", "progress", "complexity", "origins", make up a family of words that expands or contracts according to contexts, notes Trouillot. North Atlantic fictions then, are purposefully ambiguous but simultaneously universalizing, all-encompassing, and absorbing.

The next section details the workings and strategies that the Neolithic/Formative paradigm uses to project this Euro-American experience to the rest of the world.

## A brief history of the Neolithic/Formative paradigm

The Formative period has been generally characterized as a historical process that marks the shift from mobile lifestyles based on hunting and gathering to settled communities of farmers, signaled by food production, and accompanied by the creation of villages, and the use of technologies such as pottery and metallurgy. Echoing the Neolithic paradigm of the Old World—a term originally coined by John Lubbock (1872:2) to refer to a later "stone age" characterized by polished "weapons and instruments"—in the Americas the Formative has been viewed in different registers: as a new economy, a chronological period, a developmental stage, and/or a technological transformation (e.g. Bennet and Bird 1964; Silverman 1996; Rowe 1962; Willey and Phillips 1958). Most explanations for this transition rely heavily on evolutionary frameworks and political economy models, approaching this process as a sociopolitical threshold generally driven by a transformation of modes of production, or more specifically, by the adoption of agriculture (Johnson and Earle 1987; Service 1975). Willey and Phillips (1958:146. Emphasis added) originally defined the "American Formative" by the "presence of agriculture, or any other subsistence economy of comparable *effectiveness*, and by the successful integration of such an *economy* into well-established, *sedentary village life*". What Willey and Phillips called a "historical-developmental scheme" was largely inspired by Julian Steward's (1949) classificatory program, designed to accommodate all historical and cultural processes in the Americas, regardless of their variations. In models inspired by social evolution, the labor and technological

demands of food production paved the way for the transition to sedentism—including the creation of infrastructure for storage and habitation that led to the formation of permanent settlements, which in turn provided the conditions for population growth and the development of complex sociopolitical forms (e.g., Childe 1946; Hass et al. 1987; McGuire 1983; Ucko et al. 1972; Upham 1990). Historically, the village as a settlement type appears subsumed under these broader processes, such as the emergence of political hierarchies and the development of agriculturalization.

The Neolithic and Formative paradigms have long conditioned much of what we know about what life was like in the past. However, in the last 20 years, these paradigms have been insistently interrogated considering multiple lines of evidence that challenge the temporality and the nature of the process (e.g., Bailey et al. 2005; Lavallée 2006; Lumbreras 2006; Robb 2013, 2014; Roddick 2013; Scattolin et al. 2009; Thomas 1993, 1999, 2004a, 2004b; Whittle and Cummings 2007; Whittle and Bickle 2014; Zeder 2009). In Europe, Julian Thomas (1993) examined how the Neolithic paradigm operates as a totalizing discourse that obscures rather than clarifies prehistorical processes, such as the development of food production. Thomas traces the history of the word through a discourse analysis of paradigmatic texts, noting that the first definition of the concept, in Lubbock's *Prehistoric Times* (1872), made no allusion to agriculture or to any other type of subsistence economy, but was used strictly as a chronological and developmental descriptor. Piggott (1965) "included pottery as an element of the original definition of the Neolithic" (Thomas 1993:362) when he reiterated Lubbock's classification in his book *Ancient Europe* (1965). But in Hawkes' *The Prehistoric Foundations of Europe* (1940), published 25 years prior, Thomas already finds the word deployed in a cultural sense, to characterize funerary customs, pottery, and other technological attributes. However, it was

Gordon Childe (1925, 1946, 1957) who first referred to the Neolithic as entities constituted by subjective associations or "peoples."

As Bruce Trigger (2006) writes, after the publication of Childe's *The Dawn of European Civilization* (1925) "the Neolithic period was no longer seen primarily as a *stage* of cultural development but, rather, as a *mosaic* composed of sharply delineated *cultural groups*" (Trigger 2006:247. Emphasis added). Childe understood that these cultures shared a variation of a basic material repertoire that included pottery, agriculture, polished stone, and houses (Thomas 1993:366). That the term "Neolithic" is used to describe "age", "period", "cultures", "settlers", "expansion", "colonization", "economy", "agriculture", "farmers", "industry", "technology", "societies, "communities" "settlements, "ideology", and "structure" reveals that there is no single or self-evident phenomenon clearly designated by that label; rather, "Neolithic" has the character of other North Atlantic fiction: it is polysemous, indexing a proliferation of meanings. The author recognizes that although it has often been presented as a coherent whole, the period and its processes "ha[ve] to be broken down, and recognised as something fragmented and dispersed, localised in its effects, with no overall direction of intention behind it" (Thomas 1993:389-390).

The discursive critique of the Neolithic has been amplified by an epistemological deconstruction of archaeology as an inherently modern discipline and practice (Dawdy 2010; González-Ruibal 2013; Lucas 2004, 2005; Thomas 2004). With its ideology of progressive temporalities that "valorizes newness, rupture, and linear plots" (Dawdy 2010:762), it is not surprising that archaeology as an epistemological project emerged as the West was becoming global. In terms of its epistemology of time, the process began with the transformation of sacred time into secular time during the Renaissance, followed by encounters with "Others" during the age of discovery, and the technological advancements brought by these new scientific travels.

Secular travel literature, in particular, described the self-realization of man instead of the progress of human salvation, whose historical transformation could be directly observed by going to other geographical locations around the globe, producing a spatialization of time that ultimately resulted in the possibility of thinking about different epochs (Fabian 1983; Koselleck 2004; Trouillot 1991). As Koselleck (2004:236) noted, the temporality of modernity was defined by its own regime of historicity, signaled semantically by the emergence of the concept of History (*Geschichte*), but also by conditioning a new kind of historical experience where time was "no longer simply a medium in which all histories take place." One of the greatest achievements of the philosophy of the Enlightenment was turning history into a general concept, as something that "no longer occurs in, but through time" (Koselleck 2004:236). That the semantic shift was also ontological is expressed on the notion of "Prehistory" itself, which was not just about chronology, but about the priority given to material culture as a source of knowledge. Archaeology emerged as a response to the need for building a new authority for understanding the past that did not rely on written documents, but on material traces (Lucas 2004).

Other authors have examined the ways in which the origins of agriculture operate as a "Rousseauian illusion" (Graeber and Wengrow 2018), a myth mobilized to explain the emergence of institutional inequality:

> "For centuries we have been telling ourselves a simple story about the origins of social inequality. For most of their history, humans lived in tiny egalitarian bands of hunter-gatherers. Then came farming, which brought with it private property, and then the rise of cities which meant the emergence of civilization properly speaking. Civilization meant many bad things (wars, taxes, bureaucracy, patriarchy, slavery…) but also made possible written literature, science, philosophy, and most other great human achievements."

But archaeological realities, as many authors have noted, do not map onto this particularly modern idea of how inequality originated. Indeed, in Europe the expansion of agriculture appears as a unidirectional and generally irreversible process, which can be traced from Anatolia to southeastern Europe, proceeding northwest towards the Atlantic and the Baltic (Robb 2013; Zeder 2009; Zeder and Smith 2009). The "package" that includes "farming, pottery, polished and ground stone tools, sedentary villages, and ritualism" never arises simultaneously at the start of the process (Robb 2013:667), but instead behaves as a movement of "cumulative directionality" that lasted over 3000 years. In the Americas, on the other hand, a multi-directional transformation occurred, where different centers of plant and animal domestication appeared at a continental scale. In Central and South America this transformation involved a complex assemblage of plants and animals over broad landscapes, although most plant domesticates originated in Neotropical forests (Piperno 2006a, 2011; Piperno and Dillehay 2008; Piperno and Pearsall 1998). Several species of *Cucurbita* (squash) have been recovered in Perú, Ecuador, Colombia and Panamá starting approximately at 11000 BP (Piperno et al. 1985, 2000), peanut and manioc appear in the archaeological record ca. 8500 BP in northern Perú (Piperno 2006b), while it has been established that the wild ancestor of maize is not native to the semiarid Mexican highlands, but the lower, moister, and warmer ecosystems of the states of Guerrero and Michoacán (Doebley 2004; Matsuoka et al. 2002). There is evidence of ecological engineering in the form of small-scale irrigation as early as 6000 BP in the western Andean foothills of northern Perú (Zaña valley), and agriculture appears well established by 4000 BP, managed by people who lived in small, seasonally dispersed settlements (Dillehay et al. 2005) rather than sedentary villages. The adoption of a "Formative package" can be further questioned considering numerous and well-documented examples of fishermen with expert hunting and fishing technology at least

around 5000 years BP, and with ample capacity to produce surplus (Ames 2002; Arnold 1995, 2007; Arnold and Bernard 2005; Ballester and Gallardo 2011; Llagostera 2005; Santoro et al. 2016). In sum, the archaeological evidence goes against the pervasive association between individual aggrandizement and personal power with political hierarchy and wealth accumulation that seems so logical to Western social science. Prehistory, as Graeber and Wengrow (2018) conclude, has been used as a blank canvas for the projection of modern philosophical dilemmas.

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The spatialities and temporalities of the Neolithic/Formative have been replicated in the Atacama. The Formative is a phenomenon traditionally characterized by the introduction of elements that innovated ancient Archaic practices of hunting and gathering on the coast and the highlands, generating economic and social transformations that reached a turning point around 1000 BCE (Núñez 1989). From this date onwards, both residential and funerary sites start to show greater material diversity, indexing short and long-distance trade between the valleys, the coast, the highlands, and Northwestern Argentina (Rivera 1975; Muñoz 1987; Núñez and Dillehay 1995). Such contacts are represented by new technologies like pottery, textiles manufactured using fibers of domesticated camelids, gold and copper metallurgy, and cultivated plants of foreign origin, including maize, gourds, beans, and cotton (Focacci 1974; Santoro 1980; Dauelsberg 1985; Rivera 2005). If the earliest definitions emphasize style or stage (Uhle 1922; Bird 1946), after the 1950s, this cultural change was understood as an adaptation to a new economy (Dauelsberg 1972; Mostny 1981; Muñoz 1989; Núñez 1974) (Table A.1.1). The switch

from culture to economic transformation was accompanied by a belief not only in the inevitability of the process, but in the unquestionable advances wrought by food production:

> "The emergence of this new form of economy, which in some regions appears associated with animal husbandry, meant a larger organization of people and the increase of specialization [...] From this moment, man has a new conception regarding food procurement: he goes from a predatory economy to one where he is a producer, a fact that will be transcendental for his later development." (Muñoz 1989: 107, translation my own).

These tenants were not seriously questioned until the 2000's. Following other continental trends, recent investigations in the Atacama have put into question the extent to which these transformations could be logically explained by migrations or cultural contact. Over the last 15 years, the study of architecture, pottery, and the domestication of animals and plants has documented a long process of changes that can be traced back to the Late Archaic, rather than to the external influences radiating from the civilizational centers of the Andes (Agüero 2005; Agüero et al. 2006; Cartajena et al. 2007; García et al. 2014; Nuñez 2005; Núñez et al. 2006; Núñez and Santoro 2011; Uribe 2009; Vidal et al. 2012). The technological innovations seen in the archaeological record, once understood as the product of a "more *rational* search for resources" (Núñez 1989:83, translation my own. Emphasis added), are currently seen as evidence of a situated historical phenomenon (e.g., Núñez 2006; Núñez and Santoro 2011; Uribe et al. 2020). Uribe and Adán (2012:30), for example, argue that in Tarapacá populations would remain in constant and high mobility from the beginning to the end of the Formative, under the same archaic pattern, using temporary settlements. Along these lines, others have stated more explicitly that "the Formative in Tarapacá does not necessarily represent an ideal of progress, but the expression of the universal and tragic human condition: the distinction between nature and culture" (Uribe et al. 2015). Conceptual differences aside, these interpretations remain locked in

Cartesian binaries that are committed to questions of complexity. Irrespective of their theoretical stances, their framework remains interested in characterizing large-scale processes that are premised on the tension between the separate domains of nature and culture.

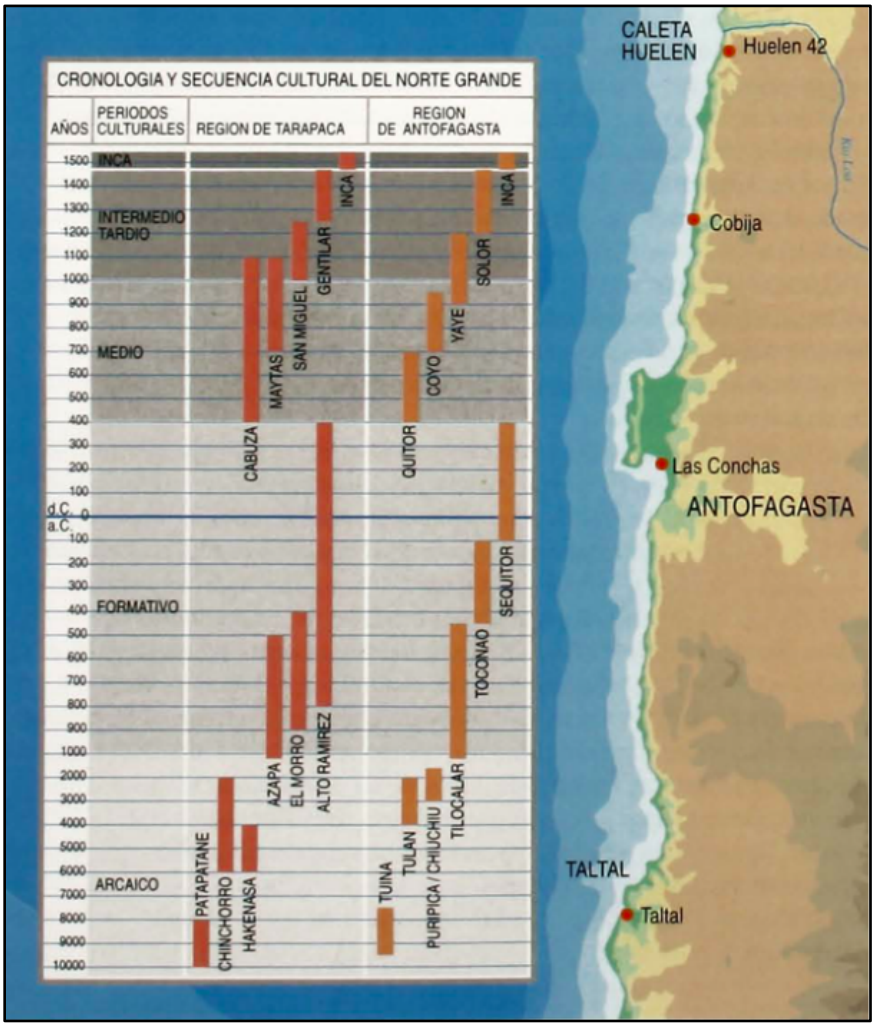


Figure 1. 7. Systematization of (pre)history: Culture-historical sequence for northern Chile (From Museo Chileno de Arte Precolombino 1997:16).

The colonizing force of science carved out the space to introduce a universal order into prehistory (Figure X), and with it, as Timothy Mitchell (1998: ix) mentions, "the spread of a political order that inscribes in the social world a new conception of space, new forms of

personhood, and a new means of manufacturing the experience of the real". Putting both the temporalities of progress and the absolute space of nature as the spatio-temporal frame of reference for history, the colonization of science worked to legitimize historical truth through these classificatory models. Reduced to epochal events, particular historical projects—such as the creation of the archaeological landscape in Guatacondo—become one more narrative of success in the long story of Civilization.

Undoing these fictions thus offers the possibility for a different kind of history. What are the openings that it can create for archaeological inquiries? What kinds of specific stories can be told or made visible by recasting prehistoric phenomena dislodged from the teleology of modernity? In the following chapters, I develop a proposition that seeks to move away from questions of order and origins and the linear temporalities that produced them, by decentering conventional objects of archaeological analysis. Chapter 2 suggests a conceptual and methodological move from the village to the landscape to grasp the temporal rhythms of the mundane, an attempt to propose a different imaginary of the past. Chapter 3 suggests a move from architecture to building in order to invoke the particular spatiality that architectural interventions in the Guatacondo valley produced, one that shows the village as part of a much broader network of places across the landscape.

## CHAPTER 2. Contesting narratives of settled life

*"The villages and tiny settlements lie scattered along the foot of the Andes. Each community lives a life unto itself. Isolation is here an outstanding fact, traffic with the outside world being both feeble and irregular...four centuries, and at the end of them a railway, have not altered the essential pioneer quality of the life of desert communities…"*

- I. Bowman, "Desert Trails of Atacama", 1924.

On March 6th, 1963, less than a month after de Bruyne reported the discovery of the old village of Guatacondo, the *Consejo de Monumentos Nacionales* (CMN) granted full tuition of the archaeological exploration of the valley to the National Museum of Natural History (MNHN). The discovery must have caused quite an institutional impact, because shortly after the MNHN was organizing its first field trip to the Guatacondo valley (Mostny and Niemeyer 1963). In September, Mostny and her team had completed surveying, mapping and excavating part of the old town, now called Guatacondo-1 (G1). The earliest report describes the valley as an unstable ecology, with "no vegetation" but great expanses of cultivation fields, old and new, revealing a relatively "intense pre-Columbian occupation whose importance was likely centered on its location along routes that connected the coast to the Altiplano" (Mosnty 1963:5). After the first visit, Mostny recognized that the existence of these settlements was quite unique: "The most distinctive feature of this archaeological zone is the villages. The largest and most clearly defined settlement pattern is at the Guatacondo site G-1 [...] within a radius of 9 km are found several similar sites [...] All have in common an approximately circular plan for their enclosures" (Mostny 1980:92-93) (Figure 2.1). The villages of the valley not only became the center of successive archaeological investigations but became quite paradigmatic of the process of

agriculturalization in northern Chile, figuring in almost all histories about the origins of social complexity.

MUSEO NACIONAL DE HISTORIA NATURAL

NOTICIARIO MENSUAL

N° 79 Santiago (Chile), Febrero de 1953 Año VII

UN PUEBLO REDESCUBIERTO

El colaborador científico del Museo Nacional de Historia Natural, ing. Emil De Bruyne de Chuquicamata, ha hecho últimamente un hallazgo sensacional: un pueblo prehistórico en el área desértica del Norte Grande.

de agua, encontrándose el punto más cercano donde proveerse de ella a unos 3.5 kms. de distancia. Las arenas del desierto han ivadido por completo las construcciones, de modo que es casi imposible ubicar el pueblo desde la tierra, sin pre-

Figure 2. 1. Front page on the MNHN's monthly bulletin displaying the spectacular aerial view of G1 (From Mostny 1963).

This chapter proposes an archaeological investigation of a pre-Hispanic landscape, seeking to decenter the village as a privileged object of study. I problematize the "household" as an object of archaeological inquiries to contest conventional narratives of settled life, part of the

operation of what I have been calling the Neolithic/Formative paradigm. The focus on the household as the main unit of social reproduction overestimates the role of sedentism and, more specifically, the village as a precondition for so-called complex forms of sociopolitical organization. In doing so, I argue that this focus fails to recognize that "houses" are only one component in a larger assemblage of material and social relations that encompasses human and non-human agents, entangling them in a wide array of practices that dissolves the nomad/settled dichotomy. Committed to an understanding of everyday lives, this work acknowledges its intractability at the scale of individual lives, gestures, discourses, or circumscribed temporalities. This limitation requires a reformulation of the importance of the materiality of the everyday and a recalibration of the scale(s) at which human and technological entanglements operate, turning to landscapes as both an object of analysis and conceptual framework that addresses some of these dilemmas.

My analysis is anchored in a pedestrian survey in the vicinity of G1 and G4 and valley-based photogrammetry, following material traces outside the bounds of houses to reconstruct a network of overlapping places that gives us a glimpse of what this landscape looked like two thousand years ago. The village no longer appears isolated but as part of an articulation of places in the landscape that created a hybrid assemblage of humans, crops, water, forests, and animals, to mention only some of the material entities that were surely part of a larger cosmopolitical order (Sahlins 2017). By making visible these material connections, the chapter offers a temporal snapshot of the valley where the village no longer appears as the center of social life, but where the everyday transpires through flows of people and things beyond particular physical locations.

## Locating Guatacondo

The small valley of Guatacondo is located in the southern portion of *Pampa del Tamarugal* (PDT), a dry, elevated plateau between the Andes and the Coastal Cordillera, in the Tarapacá region of northern Chile. The environmental setting of Guatacondo is often referred to as the "hyper-arid core" of the Atacama Desert given that precipitation is practically nonexistent, and the areas between valleys and canyons (interfluves) are entirely devoid of macroscopic life (Gayó et al. 2012; Nester et al. 2007)[1]. The water that feeds Guatacondo's west-flowing stream comes periodically from snowmelt and seasonal runoffs that flow through this ravine during the Austral summer. Between December and March, tropical moisture from the Amazon spills over the crest of the cordillera and into the western flanks of the Andes, causing torrential rains in the Altiplano that cascade through these narrow canyons and into the PDT (Gayó et al. 2012). Guatacondo's waters were seasonal during the period under study as well (~2600 to 1900 cal. years BP), but ecological evidence suggests that a humid cycle in and around the PDT basin was underway (Gayó et al. 2015; Williams et al. 2008). During this period, many wild and domesticated plants make their first appearance in the archaeological record, in what some authors have referred to as a "Green Revolution" (Ugalde et al. 2020). Algarrobos (*Prosopis*), pervasive in the region, appear in the archaeological record of the Atacama Desert at 4250 cal. years BP in a coastal site (Lluta 13) on the northern side of the PDT, and at 2050 cal. years BP in Ramaditas. This has led authors to propose that algarrobo trees were introduced from the eastern

[1] Hyperaridity and low moisture are effects of large-scale atmospheric subsidence, the cold north-flowing ocean stream known as the Humboldt current, and the altitude of the central Andes (Houston and Hartley 2003).

flanks of the Andes and eventually transformed by humans into a silvicultural resource (McRostie et al. 2017).

For the neighboring Quebrada Maní, just south of Guatacondo, three episodes of human occupations that occurred between 2300 and 700 cal. years BP, approximately, have been identified. Archaeologists and environmental scientists interpret this clustering of activity as moments of increased productivity that was the result of more surface water in Maní: once it became available, life invaded the landscape and created an oasis for human activities (Gayó et al. 2012a, 2012b). It remained, however, limited to ephemeral discharges that did not last throughout the year—confined to the spring-fed headwaters. The development of projects of artificial irrigation using canals to manage these superficial streams for maintaining crops and trees begins around 2500 cal. years BP (Segura et al. 2021; Ugalde et al. 2020) and is a manifestation of a long ecological relation that demonstrates people's careful attunement to the environmental rhythms of the desert[2].

One of the most drastic changes in this landscape has been the disappearance of the *Prosopis* forests, *algarrobos* and *tamarugos*, that once dotted El Tamarugal. Bowman (1924:15-16) reports seeing woodcutters, or *leñadores*, on his way from Lagunas to Matilla: "we saw men digging fuel from the ground and loading it upon wagons from the station—an astonishing way to get firewood!". Mining for wood was a common activity for desert dwellers, to the surprise of Bowman and other travelers. But perhaps more astonishing was witnessing its disappearance:

[2] In the last 10 years there has been a surge of studies that focus on the intersection between old environmental cycles and the (pre)historical dynamics of human populations—and increasingly, on the prehistoric documentation of the "Anthropocene" (e.g. Beresford-Jones et al. 2015; García et al. 2014; Gayó et al. 2015, 2019; Joly et al. 2017; Jordan et al. 2014; Latorre et al. 2005, 2013; Maldonado and Uribe 2015; McRostie 2017; Núñez et al. 2013; Osorio et al. 2017; Pearsall 1989; Pfeiffer et al. 2018; Santoro et al. 2017a and 2017b; Santoro et al. 2019; Sitzia et al. 2019; Tully et al. 2019; Ugalde et al. 2020; Uribe et al. 2020; Zori and Brant 2012).

"Frézier reports that in 1712 there was near Calama a forest of algarrobos where vegetation is now almost entirely absent. San Roman saw in the southern Desert of Atacama dead forests of algarrobo in the sand. They were dug up for firewood. Plagemann notes the existence of algarrobo forests sixty or seventy years ago close to the village of Tarapacá where now is complete desert" (Bowman 1924:16). The long history of the *Prosopis* forests started dwindling in the 19th century, when the PDT was opening up for a new industry: the exploitation of nitrate. By 1913, some 50 years into the nitrate boom, the Tarapacá and Antofagasta regions supplied 58% of the global demand for potassium nitrate, or saltpeter, used as fertilizer and gunpowder (Marín Vicuña 1931). Interior valleys like Guatacondo, began producing most of the fresh produce for the growing population of the *oficinas* (nitrate mining towns), imbricating them in the ever-expanding world-system of capital.

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When the team led by Grete Mostny began to work in the valley, their focus was the village of Guatacondo-1, the site that had been photographed from the air. However, many other archaeological features were observed and recorded, including lithic workshops, rock art and geoglyphs, a small cemetery, in addition to the enormous expanses of agricultural fields and irrigation canals (Figure 2.2).

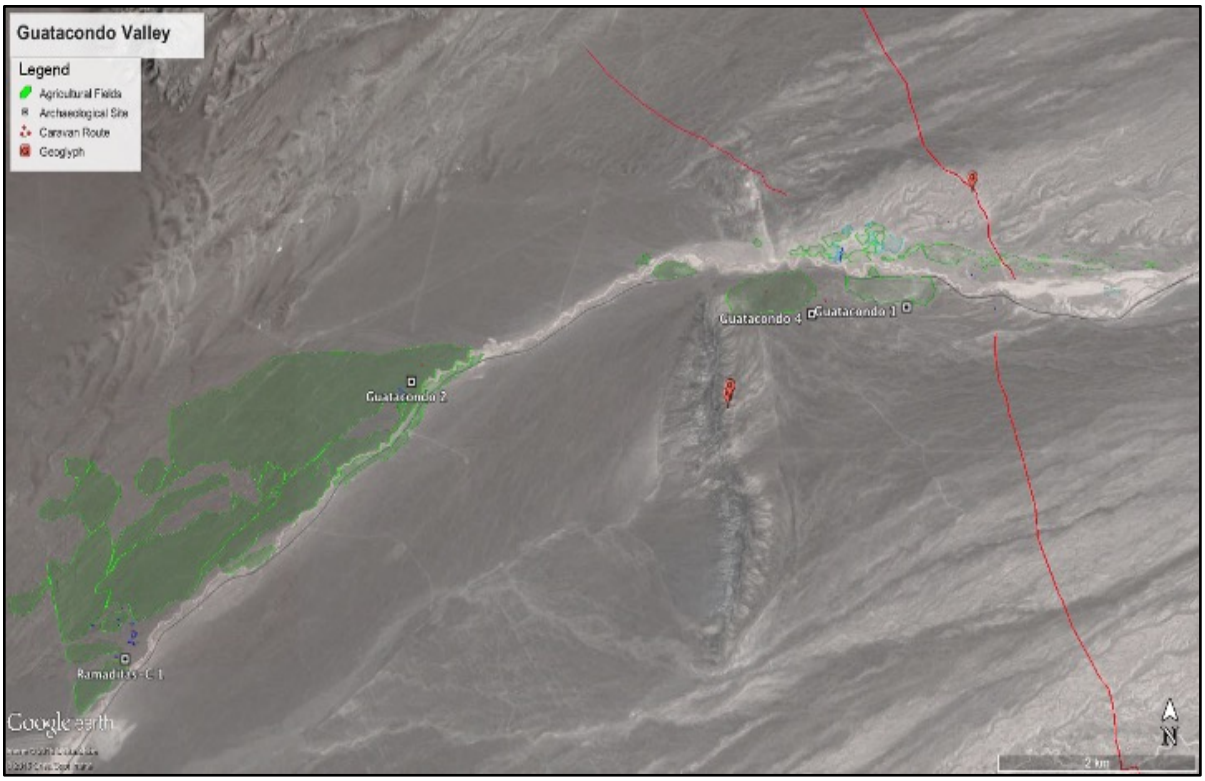


Figure 2. 1. View of the lower portion of the Guatacondo valley showing the location of the sites mentioned in the chapter.

The following field seasons, between 1965 and 1969, were partially supported by a described as a village with "an oval plaza surrounded by a wall of rectangular adobe bricks", around which "are a number of enclosures which served as habitations and storage structures" (Mostny 1980:93). Meighan (1980:107) described these enclosures as "houses" of two different types: 1) without direct communication to other structures; and 2) groups of two or more rooms communicating with one another, accessed through passages and doorways that structurally connected all the units. Given that each of these "rooms" included features like fire-pits and *metates*, they were defined as houses that were progressively added "as a family expanded and

groups of relatives lived together". Several enclosures at the site were excavated[3], revealing other interesting architectural features: roofing, posting, doorways, windows, storage bins or silos, and hearths. Houses were entered through a narrow door in the wall, accessing multi-room structures that were "clearly made by adding rooms to existing structures" rather than originally built as such. Most of the units were built into the natural surface, closely resembling a pit house—a kind of dwelling widely distributed in the Americas. Meighan (1980:106), however, also noted some differences: "Unlike pit houses in many areas, the pit at Guatacondo was merely the source of the wall material". Contiguous dwellings with a common entrance were inhabited by "some sort of extended family (parents and married children)", while some bigger groupings represented larger kin groups. He saw in the spatial layout of the village, "a definite north side and south side to the community which suggests the possibility of a moeity organization." (Meighan 1980:108).

[3] 26 in total, according to Meighan. "The work was conducted in August 1969. The field crew included myself, my wife Joan, Dr. C.B. Donnan, and Leonard Foote from UCLA, working in collaboration with Dr. Grete Mostny and Patricio Núñez of Chile's National Museum of Natural History. Ten laborers from Oficina Victoria were employed as crew, and we also had a driver from the National Museum who assisted us in the field. The field work was supported by NSF Grant GS 2652." (Meighan 1980:99).

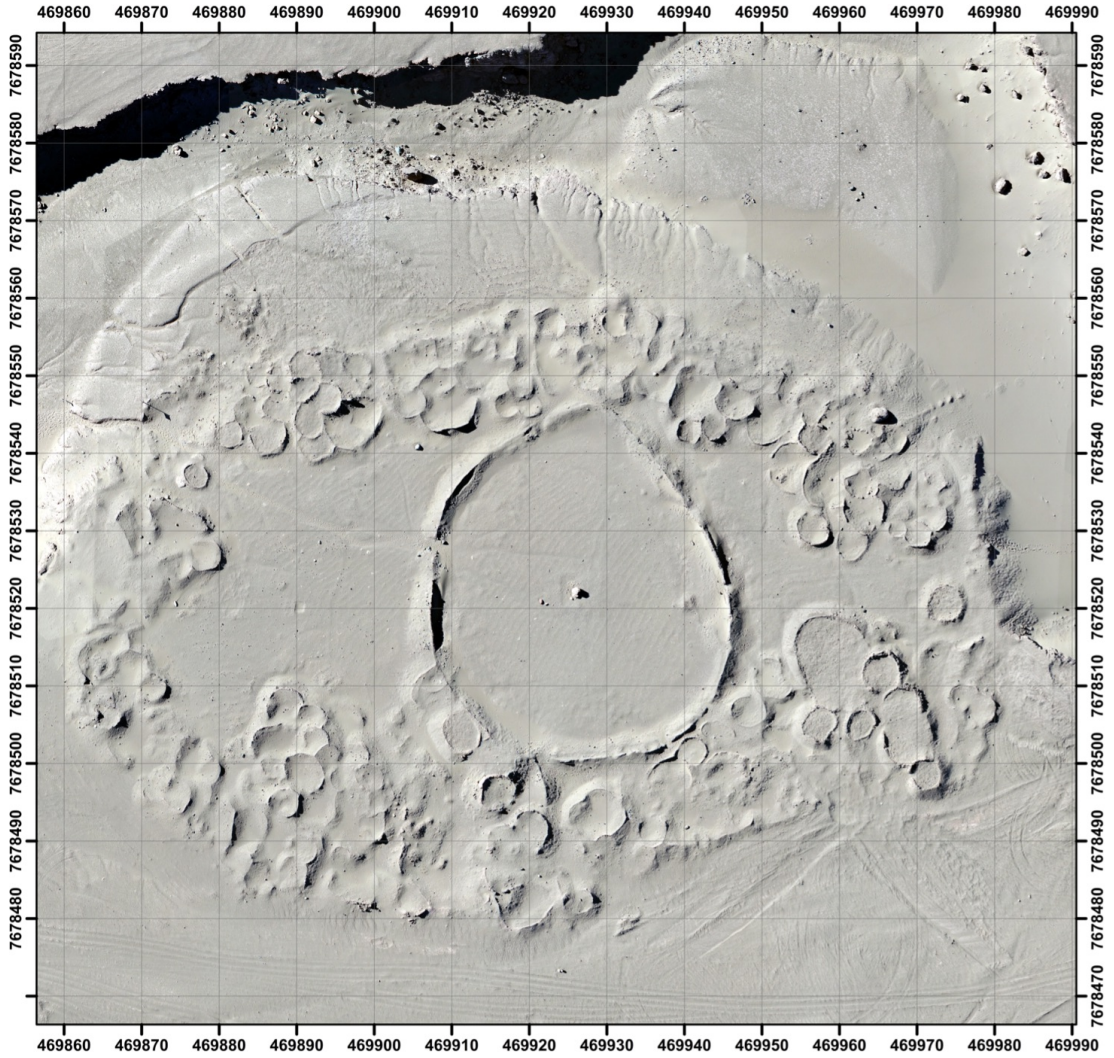


Figure 2.  2. Photogrammetry of G1, using an UAV (drone). The images were processed using ArcGIS.

The uniformity of the material culture—plain pottery, coiled basketry, grinding implements made with fine-grained, dense stones—led researchers to believe that the occupation of G1 was brief, with possible transient reoccupations that did not involve any substantial modifications of the ground plan of the village. The sequence of building activity showed that

multiple units were being occupied simultaneously, but none of the excavated structures revealed any sign of actual re-use. Meighan and True (1980) concluded their assessment of G1 explaining that the abandonment of the area was the result of the gradual desiccation of the drainage, and the subsequent reuse was elicited by occasional moist conditions. This phenomenon, they argued, was spatially and temporally part of the larger "Faldas del Morro" complex, local groups that practiced a "mixed economy, with incipient agriculture playing a part, though minor in some areas, in the subsistence of the people" (Meighan 1980:126). This cultural complex was considered the manifestation of the earliest semi-agrarian communities of the lowlands of northern Chile, originally defined through its mortuary remains, which included the interment of individuals with turbans, fishing equipment, gourds, basketry, and plain monochrome pottery (Núñez 1970). Meighan (1980:126) argued that:

> "The Guatacondo village itself was probably more dependent on gathering than farming for its food resources. Incipient agriculture was also accompanied by incipient pottery use and the beginnings of permanent settlement of small size".

However, he saw this as a marginal and derivative development from transformations that began elsewhere, asserting that while the groups of Guatacondo had some degree of mastery over specific technologies, they were all at a very rudimentary level compared to the complexity shown by the groups of the Central Andes during the same period.

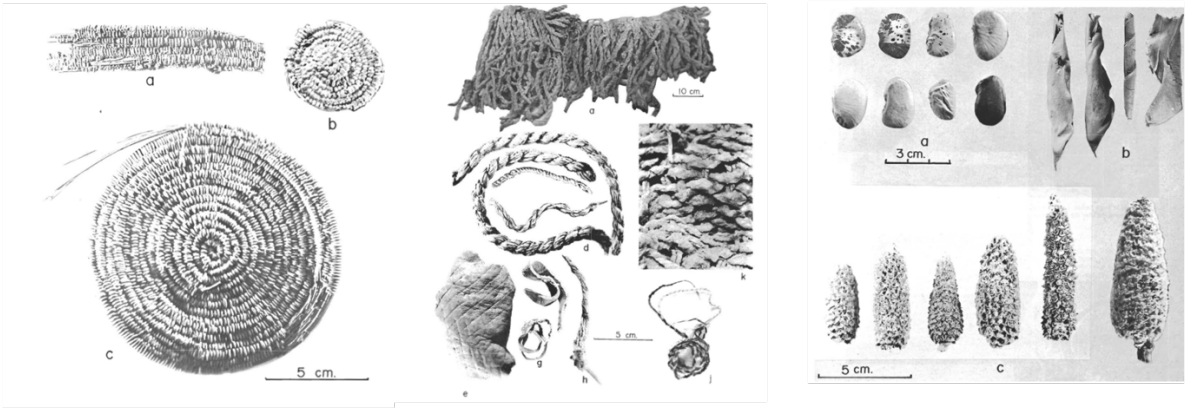


Figure 2. 3. Miscellaneous material from the excavations of G1, including basketry, cordage, and cultivated plant remains (From Meighan and True 1980: Plates 12, 13, and 15).

Decades later, another settlement identified by Mostny, Ramaditas[4], revealed similar evidence but different interpretations. The settlement was described as a small village comprised of three separate complexes, with a very similar construction pattern to the one displayed in G1, in association with tillage systems, a network of ancient drainage channels and dams, lithic and ceramic scatters, and furnaces for copper smelting (Graffam et al. 1996; Shea and Rivera 1995/1996) (Figure A.1). Most of the descriptions made by Meighan for G1 were also applicable to Ramaditas: angular walls were rare, and almost exclusively used in entryways and passages; the majority of the enclosures were accessed through narrow doors that often appear connected to other structures; and some of the “houses" had a window or small opening near the top of the wall. Each of the complexes show common spaces or patios that serve as connectors between smaller structures, and with few exceptions, all of them share walls. These patios would have been formed by enclosing areas bounded by other structures with a low wall, to form an open

[4] Ramaditas appears as G-II in Mostny’s (1970) map, and G-6 in the map published by Mario Rivera (2005:10).

space that was partially roofed—judging by the placement of a row of posts parallel to the exterior wall (Martindale 2005:154) (Figure 2.5). Wooden poles were sometimes used for the support of roofs manufactured using different types of vegetation that grew along the seasonal stream (Figure 2.6).

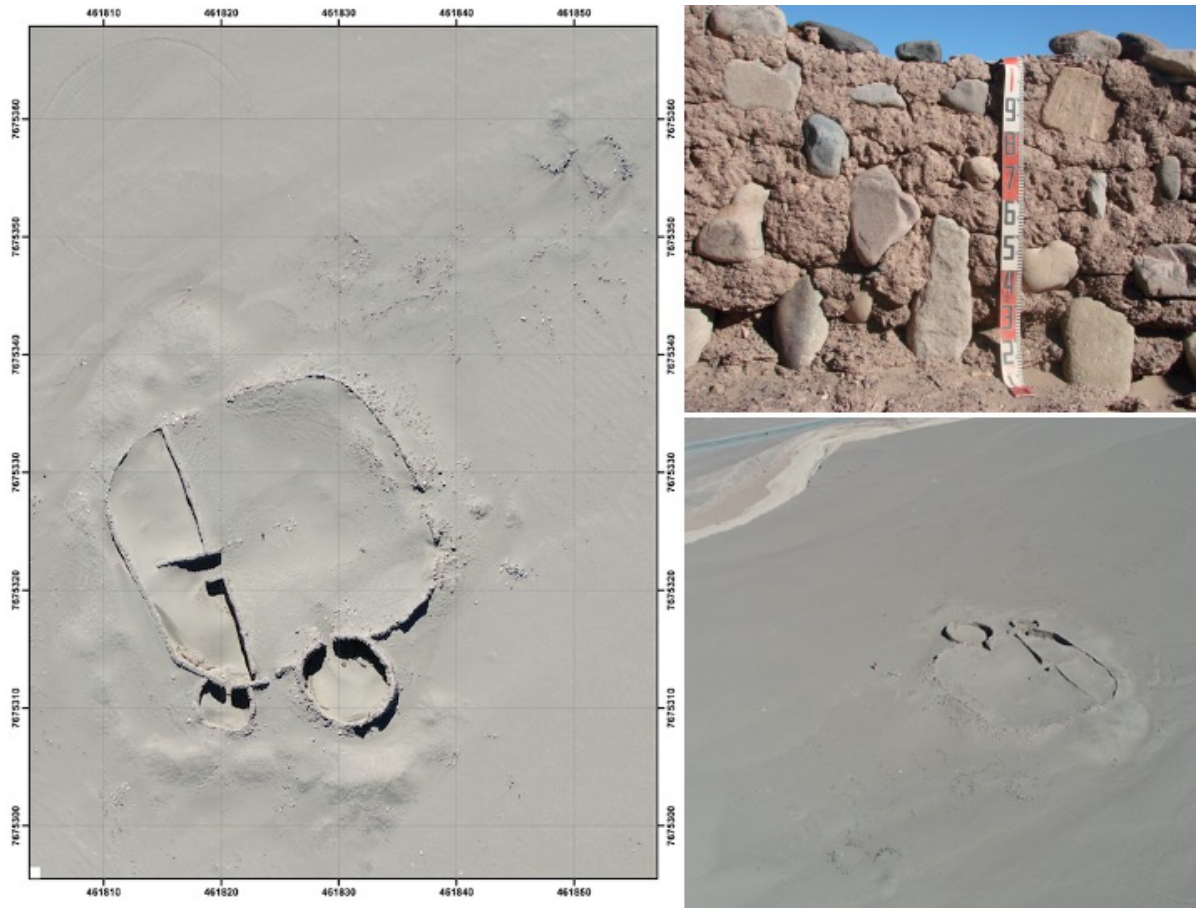

Figure 2.  4. Different views of Compound 1, Ramaditas.

Figure 2.  5. The system of wooden posts for roof support is still visible in some constructions. In the image, tree trunks buried in the sand along the inner side of structure 1, in Ramaditas.

Excavations carried out near Compound 1 revealed what was presumed to be a well-used for irrigating neighboring fields. Subsequent excavations uncovered similar structures associated with subterranean canals and ditches underneath some structures, which was interpreted as a drainage system that provided a continuous water supply not only for the agricultural fields but also for the settlement itself (Rivera 2005). For Rivera and collaborators, this cultural development was not the result of local transformations, but a consequence of the arrival of foreign populations. Colonizers from the Altiplano introduced the technology for the construction of the agricultural system, settling in Ramaditas, where political elites were able to manage irrigation and exert strict control over staple production. Consequently, for Rivera these communities were linked through shared ideologies that would come to be recognized as the Andean civilization (Rivera 2005:30)—part of a unifying phenomenon that was known from a cultural-historic perspective as the “Alto Ramírez phase” (ca. 500 BCE-300 CE).

## From house(hold) to landscape

Anthropological concerns with built environments have a long, deep-rooted history in the discipline[5]. During the 19th century, L.H. Morgan (1985 [1878]) referred to the importance of houses for the study of the evolution of cultures. He argued that successive changes in house architecture—from huts to communal houses, to single family dwellings—offered one of the most complete illustrations of the progressive trajectory from "savagery to civilization" (Morgan 1985:6). As relics of a bygone era, architectural forms as a "fossil metaphor" was to become an important analogy for capturing the relationship between the physical characteristics of built forms and the progressive development of Man (Buchli 2013)[6].

The subfield of "Household archaeology" represents the systematization of this preoccupation with the house as an analytical unit[7]. Propelled by processualism, under this

[5] For a deeper examination of the intersection between architecture and anthropology, see Buchli 2013.

[6] During the same period, Franz Boas (1889) offered detailed accounts of house forms and modes of construction among indigenous groups of the Pacific Northwest of North America. Emphasizing on the symbolism of interior ornamentation to understand kinship histories, Boas departs from the universalism of "primitive" orders reflected in Morgan's work. He embraces an approach that centers on the cultural meanings that are attached to material worlds. Boas' influence can be seen in later scholarship about the symbolic order of the house, most notably in Pierre Bourdieu's (1970) work on the Kabyle groups (see also Carsten and Hugh-Jones 1995; Lévi-Strauss 1982, 1987; Sparkes and Howell 2003; Waterson 1990). Marcel Mauss' (2006) reflections on dwellings are also in line with this understanding of houses as culturally specific creations, as he considers house building as characteristic of "a civilization rather than a given territory", where "each house has its own sense" (Mauss and Schlanger 2006:130). Together, they represent a push against social evolutionary claims to universality, while maintaining the focus on the house as the principal site of political negotiation, social reproduction, symbolic order, and cultural creation.

[7] In anthropology, the focus on the house was followed perhaps most conspicuously by Claude Lévi-Strauss' (1982) studies on what he called "house-societies". Although not concerned with material form or architectural traditions, Lévi-Strauss developed a model through which forms of social organization with non-unilineal kinship systems could be theorized, prompting a renewed interest in houses as central cultural symbols among small-scale societies. He placed his focus of

banner the *household* was considered as the basic unit of social reproduction, composed of a task-focused group that conducts most of its activities within a specific physical setting (Wilk and Rathje 1982:620-621). It was perceived to be the most elemental level at which the process of adaptation could be studied. According to Sharon Steadman's (1996) review of what she terms "archaeology of architecture", it was Clarke's study of Iron Age houses in Glastonbury in the 1970's that originated the field of household archaeology, although the most prolific work was done in Mesoamerica (e.g., Rathje 1983; Wilk 1983, 1988, 1990; Wilk and Ashmore 1988). Wilk and Rathje's (1982) definition of the household was not automatically correlated with co-residence, but it presumed that the basic unit of social and economic cooperation frequently lived under the same roof. It was defined by three basic elements: 1) the demographic unit; 2) the dwelling, activity areas, and possessions; 3) the activities it performs. This study clearly established a correlation between labor investment in the household and degree of mobility, with larger households representing more permanence of the group in that specific location. Furthermore, the size of the household also implied a certain degree of social complexity: small households would be indicative of low social differentiation, while large households were taken to be symptomatic of social fragmentation and hierarchization.

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analysis on the house as an all-encompassing social institution, constituted by relations of hierarchy, kinship, and at times its physical manifestations—where the house was seen as the "objectification of a relation" (Lévi-Strauss 1987:155), designed to solidify unstable relations of alliance. Certainly concerned with determining patterns that could be universalized, Lévi-Strauss articulated a model out of cultural comparisons between Native American groups (such as the Kwakiutl and Yurok) and medieval feudal forms of kinship to understand the acquisition and maintenance of titles, names, estates, and hereditary prerogatives. Lévi-Strauss' *sociétés à maison* served as an impetus for a vast corpus of work on houses as sites of political, familial, and symbolic (re)production (e.g., Atkinson and Errington 1990; Beck 2007; Bourdieu 1970; Buchli 2013; Carsten and Hugh-Jones 1995; Cieraad 1999; González-Ruibal 2006; Joyce and Gillespie 2000; Waterson 1995).

Kent Flannery's work in *The Early Mesoamerican Village* (1976) effectively placed the house as a unit of archaeological analysis, which served as the basis for inferring the structure of the community as a whole, and village development more broadly. Moving between the scale of the household and the community, the village emerged as the logical aggregation of multiple individual units. He followed American archaeologist William T. Sanders' definition of the village in Mesoamerica who, following cultural evolutionism as a student of Gordon Willey, understood it as a "nucleated community with populations running at least into the hundreds and in which at least 75% of the populations derive at least 75% of their income from agriculture or some other extractive activity" (Sanders 1956, cited in Flannery 1972:38). Flannery saw analogues of village forms in the ethnographic literature, represented by two main residential strategies or social groups (Flannery 2002:418-419):

> "The first type lived in encampments or compounds of circular huts. Many of those huts seemed too small to house an entire family, and virtually all of the society's storage units were out in the open, as if their contents were to be shared. Such societies seemed analogous to peoples in the ethnographic present whose encamped group is essentially a large extended family, often patrilocal and polygamous [...] The second type of society lived in true villages of rectangular houses, each large enough for a nuclear family. In Mesoamerica the houses were of wattle-and-daub and had storage pits adjacent to them; in the Near East the houses had walls of mud, mud brick, or dry laid stone masonry and were divided into rooms, some of which served for storage [...] Such villages might have special structures that could be shrines, temples, or men's houses, but their food was not stored in such a way as to suggest communal sharing".

Flannery was aware of the often uncontested assumption of the agriculture:sedentary life:villages formula to explain shifts in settlement patterns, arguing instead that the comparative study of the village would account for its adaptive value as a type of settlement (Flannery 1972)[8].

[8] Regarding this conflation of adaptive processes, Flannery states: "Our Western eyes, grown somewhat heavy-lidded during the long search for cross-cultural regularities, had confused three variables which are not necessarily interdependent. These were agriculture (which does not require either sedentary life or villages); sedentary life (which does not require agriculture or

The assumption was that the village constituted a spatial configuration that was highly adaptable to change, such as increase or decrease in population density or storage needs. And while Flannery acknowledged that the emergence of the village was not a case of causality, the 'house form:type of society' correlation was maintained in order to explain difference[9], just as Morgan had suggested at the turn of the century[10]. For example, a few decades later, Ian Hodder (1990:44-45. Emphasis added) in *The Domestication of Europe,* considered the *domus* as pivotal in the transition to an agricultural subsistence economy in southeastern Europe, describing it as:

> "*Practical activities* carried out in the house, food preparation and the sustaining of life. But [...] secondary, symbolic connotations are given to the practical activities [...] practical acts such as the preparation and provision of food, the placing of female figurines in the house, and the burial of women and children in and around the house associate the house with the more general idea of *nurturing*. The provision of shelter and the storage of food *associate the house with caring*".

While departing from the processual interpretations of households, Hodder insists in the association of the house with notions of family structure and activities, and furthermore, imbues it with certain conceptions of domesticity that are unmistakably tied to normative values of gender. Marilyn Strathern (1988, 2016) has systematically questioned such constructions in her cross-cultural analysis of gender, offering a theory that interrogates how "woman" became a category of concern in the first place. She offers a view of social life in non-Western societies

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may not take the form of a village); and villages (which need not require agriculture, nor require year-round sedentary life)." (1972:24).

[9] As an example, 20 years later, in *Domestic Architecture and the use of space* Susan Kent (1990:127) writes "as a society becomes more socio-politically complex, its culture, behavior or use of space, and cultural material or architecture become more segmented".

[10] Taking these ideas as models for archaeological explorations, household archaeology has produced a significant amount of scholarly work (e.g., Aldenderfer 1993; Blanton 1994; Bustard 1999; Chesson 2003; Flannery 1976; Kent 1990; LaMotta and Schiffer 1999; Nash 2009; Samson 1990; Tringham 1995).

that is not structured around the conventional house-keeping arrangement of the modern nuclear family, problematizing the association of the family with the household and the allocation of gender roles that such link ensues. Citing ethnographic studies[11] Strathern notes that male or females may be members of different households, as well as experience households with both female and male heads (Strathern 2016:82). Building on the substantial feminist critique of the exploitation of women's unpaid domestic labor and the reproduction of this specific form of female dependency, Strathern exposes the cultural specificity of the nuclear family, where a husband and a wife reside under the same roof, illustrating how that such configuration is tied to a European notion of domesticity, and on philosophies that have been preoccupied with ideas of individuality, free will, transcendence, and mortality.

When subsumed under "domestic architecture" or "homes", the concept of the house tends to be underpinned by a series of factual claims, which refer generally to a built form where people take shelter, eat, and socialize, and engage in a variety of economic and symbolic activities. However, categories like household and family—with one referring to kinship and the other to locality, and an ample ethnographic archive that attests to these variations (Bender

[11] Describing the social environment and everyday life among Ashanti groups, Fortes provides a vivid picture of the rhythms of the mundane and the configuration of domestic life: "The Ashanti live in rectangular houses clearly separated from one another. A dwelling-house is occupied by what I shall call a dwelling group. Ashanti domestic organization, nowadays, is very elastic. Not only do dwelling groups vary in composition at a given time, but their membership fluctuates from month to month as people move to and fro for farming or trade [...] The most striking feature of Ashanti domestic life appears vividly in one of the common sights in any village or township. As night falls young boys and girls can be seen hurrying in all directions carrying large pots of cooked food. One can often see food being carried out of a house and a few minutes later an almost equal amount of food being carried into it. The food is being taken by the children from the houses in which their mothers reside to those in which their fathers live. Thus, one learns that husband and wife often belong to different domestic groups [...] the domestic group appears to consist of women only or of a miscellaneous assortment of men, women, and children" (Fortes 1970 [1949]:10-15)

1967)—are extremely difficult to disentangle, and repeatedly collapsed into what is believed to be a clear, visible (material), and transcultural unit of analysis. This tradition of archaeological thinking presents two major challenges for the examination of landscapes. First, the focus on the "house" as a material unit that is visible in the archaeological record privileges the study of groups that built permanent structures that can be analytically recognized as separate, bounded units (usually understood as villages). Secondly, in doing so, it perpetuates the separation between mobile/settled, hunter-gatherer/farmer, dichotomizing what was in reality a wide spectrum of mobility practices, lifeways, modes of production, and settlement systems (Kelly 1992). Put succinctly, these approaches fail to recognize that "houses" are only one component in a larger assemblage of material and social relations that encompasses human and non-human agents, entangling them in a wide array of practices that dissolves the nomad/settled opposition.

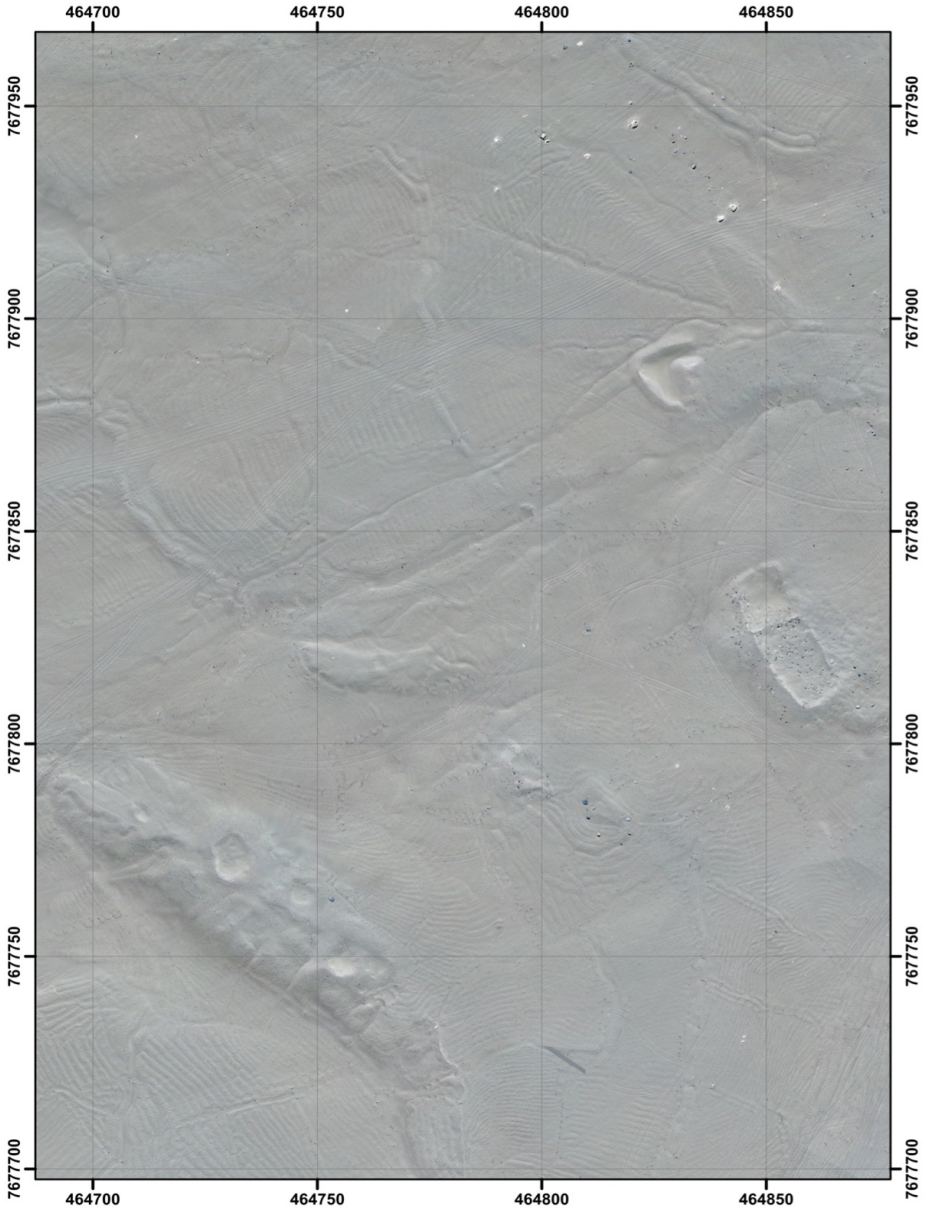


Figure 2. 6. In shifting the analytical focus to spaces outside of the village, other places in the landscape become visible. In the image, irrigation canals, melgas (extended beds), water reservoirs and other structures are seen around G2. Photogrammetry using an UAV.

Following a broad conceptual history, I take *landscape* both as an analytic framework and an object of inquiry that is capacious enough to address these pitfalls. Cemented by the

critical geography of Lefevbre (1991, 2014), social scientists have noted the relational operation of space, understood as a cultural production (Ingold 1993, 2000; Massey 2005; Soja 1996). Jettisoning the notion that space is an objective reality that exists outside of social relations, archaeologists working within this framework are concerned not with the representational qualities of landscapes, but rather with what they *do*; that is, the performative aspects of human geographies (Fowles 2013; Harris 2014; Pauketat 2001, 2008; Smith 2003). But pushing against the ephemeral quality of Latourian assemblages and distinguishing themselves from the cumulative regimes of practical acts of the Ingoldian "taskscape" (1993, 2000), some of these works have highlighted the historical embeddedness of landscapes. Neither trajectoring nor passively witnessing the passage of time, landscapes slowly record the material variations and interventions that people make in the world (Richard 2018; Robb 2013; Roddick 2013), working as "thingly archives" (Richard 2018:36). The active collaboration of *things* in the constitution of landscape is a reminder of the relevance of non-human entities that forms a "landscape of action", as Robb (2013) has called it, referring to networks of practical and material configurations that acquire historical quality by virtue of being transmitted, learned, and practiced. As such, landscapes are constructed geographies that create a palimpsest of temporalities and spatialities.

The framework that landscapes provide considers the village as only part of a broader network of spaces and places, whose complexity is irreducible to the simple aggregation of household units. As an inherently relational concept, landscapes contain people, things, plants, and animals, forests, fields, and hamlets. Switching the analytical lens to landscapes troubles evolutionary and economic perspectives that rely on the household for explaining social change and reproduction, highlighting instead the history of material entanglements between humans

and non-humans and the places they create. While the horizontal exploration of the landscape obscures the vertical distribution of material assemblages, excavations at different sites over the years have shown discrete occupational layers that are consistent with relatively short stays, or cleaning practices that prevented the accumulation of domestic refuse. Activities like cooking must have been carried out outside of individual units, and the space inside the houses seem to have been used mostly for storage and sleeping (Adán et al. 2013; García et al. 2014; Mostny 1980; True 1980).

With these considerations in mind, the next section provides a historical snapshot of the valley by trying to reconstruct the landscape during the six to seven centuries of occupation of these sites.

## Fields, forests, and hamlets: Re-imagining a desert landscape

In his Aymara dictionary, Ludovico Bertonio (1984[1612]) describes the word "pampa" as: "todo lo que está fuera del pueblo...todo lo bajo respecto de la mesa, o poyo, la tierra llana". Unlike the latin word "desertum", which alludes to a space that has been abandoned, a waste, a place without people, the indigenous "pampa" establishes a spatial distinction with the town and the morphology of the land without making reference to a place that is unoccupied or empty. And although *pampa* is now used to name the intermediate depression that forms the heartland of Tarapacá, the reference to low-lying lands and the relation between the inside and outside in relation to town provides certain clues about the existence of a space that has been rendered invisible in archaeological readings of this landscape.

Different authors have questioned the colonial legacies of classificatory systems that reduce the multiplicity of geographies and territories in the Andes to coast, valleys, and mountains. Following the work of Pulgar Vidal in the 1930's, which recognized in indigenous knowledge at least eight geographical regions distributed on both slopes of the Andes, named *chala, yunga, quechua, suni, puna, janca, rupa-rupa* and *omagua,* García (2018) describes the inherent relationality of these geo-categories. For groups of Aymara herders living in the puna of Arica, between 3000 and 4000 m.a.s.l., the "coast" refers to a space below the puna, where headwaters are located. Not the shores of the Pacific, this coast maintains green pastures for the llamas during the winter, when the grass in the puna has dried from frosts and snowstorms. It follows that "costeo" is the act of taking their animals to this space—between pampa and puna—an economic and cultural activity that not only has been overlooked by historical and archaeological reconstructions of pastoralism. The lasting agro-centrism of archeological investigations has subsumed both the place and practice of "costeo" under other categories, like "sierra" or "precordillera".

Taking this relational approach into account, and shifting the view from town to pampa, what can the spaces outside of the village tell us about what life in Guatacondo was like before and around the beginning of our era? What are the spatial features that made up this landscape?

This archaeological reconstruction rests on a valley-based survey I conducted in July of 2017, covering 2 $km^2$ around G1. It follows preliminary large-scale pedestrian survey and excavations[12] around Ramaditas, which yielded over 100 sites in an area of 28 $km^2$ (Alvarado et al. forthcoming). Additionally, the work of reconstructing this landscape involved reviewing old

[12] Fondecyt Project #1130279, "Arqueología de la Pampa del Tamarugal: EL Período Formativo como discursos sobre naturaleza, cultura, resistencia (ca. 400 AC-900 DC)". P.I: Mauricio Uribe.

reports, maps, news clippings, and site collections to provide a synthetic approach to its material characteristics. The surroundings of G1 had been described in the literature as an area with scattered workshops "in general, remains of pottery and at times of scoria mixed with coarse artifacts of basalt, occasionally quartz, projectile points, discoidal stone beads, and a relative abundance of Pacific shells" (Mostny 1980:94). Mostny's original map of the valley, published in 1970, shows a series of sites around the village, up and down the ravine, but their locations and descriptions are imprecise and hard to locate *in situ*.

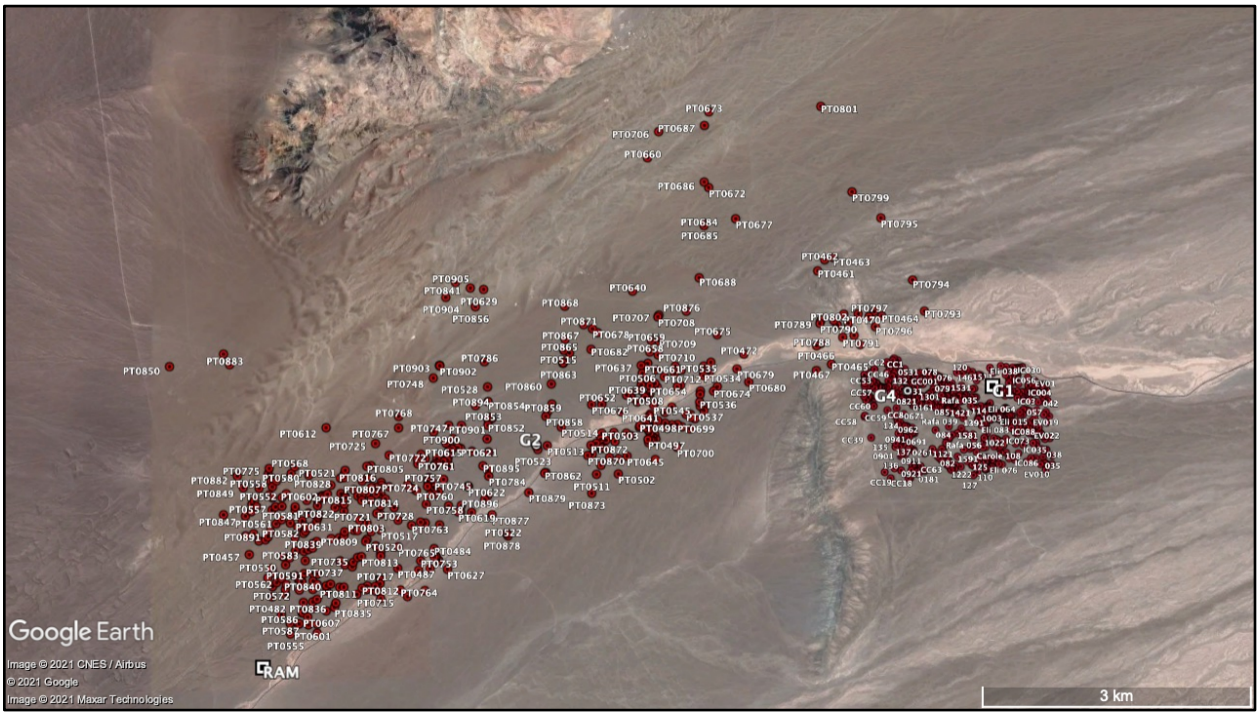


Figure 2. 7. Pedestrian surveys showed the proliferation of occupations outside the boundaries of villages.

Previous studies have calculated that the area covered by agricultural fields is over 500 hectares, which were irrigated with water available on the main riverbed since there are no springs or other surface runoffs in the lower section of the valley (García et al. 2014). The

variability of agricultural techniques is evidenced by the different morphologies of the tillage systems. Extended, square, and spiral-shaped beds, as well as shallow terraces have been detected, with each type yielding particular chemical signatures of the topsoil that suggest the cultivation of specific crops for each type (Segura et al. 2021). All systems, except spiral-shaped beds or *caracoles,* yielded Formative period dates, demonstrating their contemporaneous use. According to ethnographic data, each technology offers different possibilities for agricultural production: spiral-shaped and seed beds provide a slow rate of irrigation and are described as appropriate for plants with surface watering, like squash. Corn, wheat, and onions are usually grown in square beds, while grains and beans are usually planted in extended beds (Platt 1975; Urrutia 2020). Because the development of agriculture depended exclusively on seasonal rains, it has been argued that agriculture in this valley also followed a seasonal cycle based on fast-growing crops (García et al. 2014; Vidal et al. 2015). Using pollen analysis, Segura and collaborators (2021) have further demonstrated that during the Formative period crops grew in association with weed flora, resulting in different species growing alongside each other.

Figure 2.  8. Different tillage systems have been documented in the valley: 1) terracing; 2) square beds (canchones); 3) extended beds (melgas). Courtesy of Fondecyt Project #1130279.

Figure 2.  9. Tillage systems in Guatacondo: 1) Contemporary square bed (canchón) used to grow alfalfa, garlic, onions (above); 2) Extended beds (melgas) and stone hoe recovered near G4. Microfossils adhered to the surface of the instrument showed starch grains similar to potatoes (Solanum sp.) and maize (Zea mays). Courtesy of Fondecyt Project #1130279.

Analyses of botanical remains have confirmed the presence of wood both from columnar cacti and *Prosopis* sp., used for firewood and/or construction in G2 and G4 (Figueroa 2017). Three stone hoes found at G4 were tested for microfossils, which included *Zea mays*, *Chenopodium* sp., *Solanum* sp., and other starch grains that can be ascribed to tubers (Albornoz and Carrasco 2017). This confirms that corn, quinoa, and potatoes were grown and consumed in the valley rather than being exchanged or brought in from other places. Regarding macrobotanical remains, both the literature and our own studies have confirmed the presence of *Zea mays*, *Solanum tuberosum*, *Prosopis* sp., *Chenopodium* sp., *Atriplex* sp., *Cercidium* sp., *Euphorbia* sp., *Plantago* sp., and *Sphaeralcea* sp. in Ramaditas, different varieties of corn[13], lima beans (*Phaseolus lunatus*), and gourds in G1 (García et al. 2014; Rivera 2005; Tartaglia 1980). Studies on human coprolites found in Ramaditas have confirmed that human diets at the time included Cheno-ams, potatoes, algarrobo pods, and corn, small mammals, and fish (Follett 1980; Rivera and Dodd 2013; Scott Cummings et al. 2005; Thompson 2005). Algarrobo is, without exception, the most widely represented food resource in all the sites of the valley, and the microscopic examination of grinding stones have confirmed their use for the processing of algarrobo seeds and pods, rather than for cultivated crops (Tartaglia 1980).

**The materiality of the "pampa"**

The pedestrian survey in the proximity of G1 revealed that site deposits form a near-continuous cover of material assemblages and infrastructures, with boundaries that are hard to define beyond loose estimations. Their separation for analytical purposes was based on the

[13] Tartaglia (1980:131) identifies different corn "races" in Guatacondo ("Harinoso Tarapaqueño", "Chulpi", and "Chutucuno chico") based on 84 measurable corn cobs recovered in G1.

frequency of material recorded *in situ*, through which we obtained a panorama of how the area around G1 was used. Over 40 archaeological sites were identified and recorded on the southern terrace of the site (Table 2.1). Like the observations made by Mostny, we were able to identify a large area with abundant archaeological materials, including pottery, beads, lithics, shells, and archaeobotanical remains, as well as small semi-circular features with the remains of tree trunks in the center—indicating the presence of patches of *Prosopis* forests around the sites. In addition to the "workshops" described by Mostny, we recognized different types of agricultural fields, caravan routes, funerary areas, and a system of stone alignments and geoglyphs associated with single and multiple trails. These different types of sites are spatially distributed following the alluvial terraces of the ravine. Without exception, all workshops, semi-circular features, small cemeteries, or isolated burials, were found on the second terrace, while the stone alignments and geoglyphs were exclusively located on the third terrace—the geomorphological level of the pampa (Figure 2.13). The agricultural fields, on the other hand, were all located along the first terrace, closest to the riverbed and in the low-lying areas that were easier to irrigate.

| Site | N° |
|---|---|
| Activity area | 26 |
| Agricultural fields | 7 |
| Funerary | 4 |
| Lithic workshop | 4 |
| **TOTAL** | 41 |

Table 2. 1. Number of sites identified in the survey around G1 (covering a surface of 2 $km^2$).

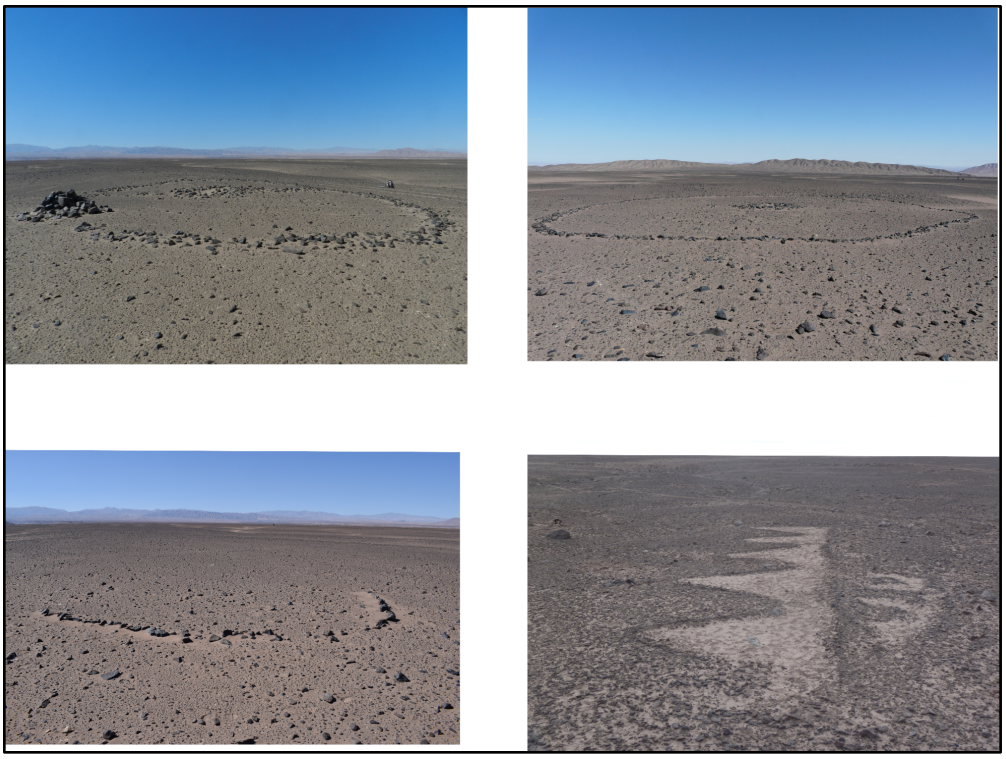

Figure 2.  10. Infrastructure of the pampa. Different forms of occupation: activity areas around trees and geoglyphs to signal roads are ubiquitous.

Figure 2.  11. Grinding tools (manos and metates) recorded in the surroundings of G1.


Figure 2.  12. The materiality of the pampa. Surface scatters around the village of G1, includes the diagnostic LCA ceramic type, basalt flakes, mineral scatters, and shellfish.

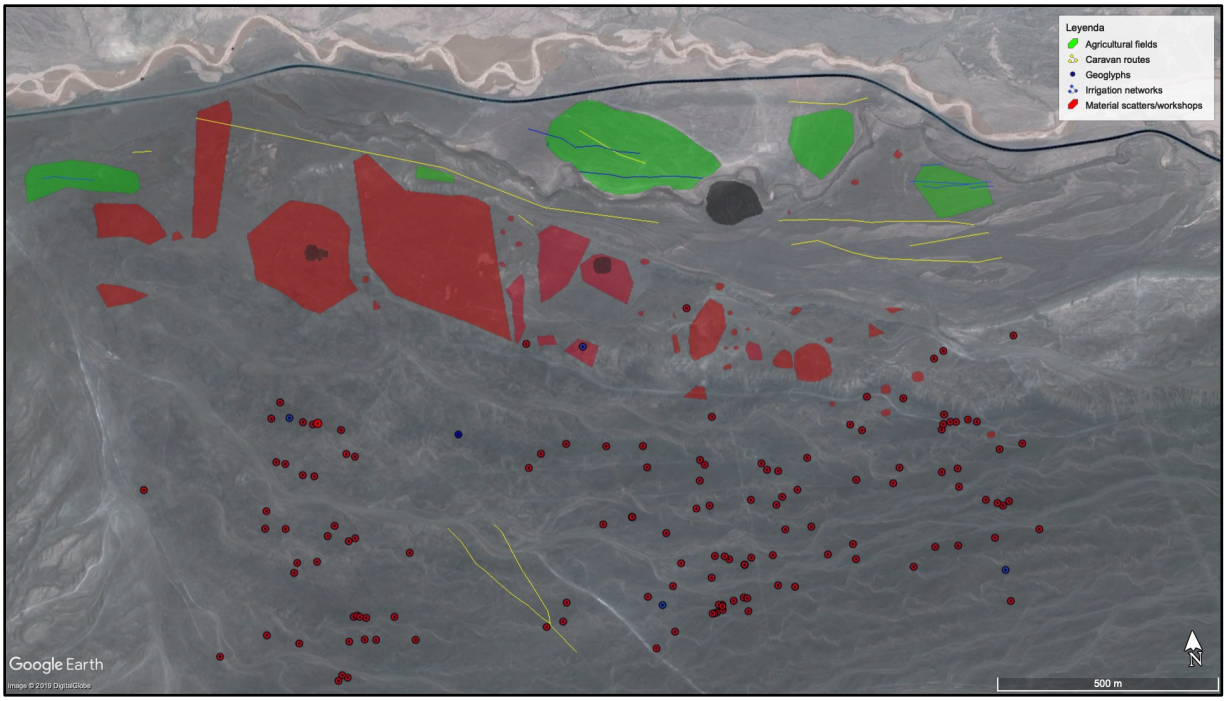

Figure 2. 13. Surveyed area around G1 showing the distribution of sites.

To further characterize these open-air sites, test pits were excavated at a small site (01GUA027) made up of material scatters around old tree trunks, forming semi-circular depressions (Figure A.2). The excavations revealed a thin layer of organic remains, including algarrobo pods, fish remains, animal and vegetable fibers, along with ceramic fragments and lithic flakes. A series of spindle whorls were recovered from the surface of the site, indicating that the processing of fibers was an activity that was taking place outside the village, while people were out in the forests or fields (Figure 2.14). A radiocarbon date obtained from the bottom layer of one of the test pits confirms a Formative period occupation for this site (2290 $\pm$ 30 cal. BP).

Figure 2.  14. A series of ceramic spindle whorls recovered at 01GUA027. Fondecyt Project #1160045 (LFI), P.I. Francisco Gallardo.

| Site | Enclosure/Unit | Conventional Radiocarbon Age (BP) | 2 Sigma calibrated result (BCE-CE) |
|---|---|---|---|
| G-1 | 153 | 2080 ± 50 | 340-330 cal BCE<br>200 cal BCE-20 cal CE |
| G-1 | 99 | 2090 ± 40 | 200-10 cal BCE<br>160-130 cal BCE |
| G-1 | 3 | 2050 ± 30 | 160 -130 cal BCE<br>120 cal BCE-10 cal CE<br>10-20 cal CE |
| G-1 | 3 | 2000 ± 30 | 50 cal BCE-70 cal CE |
| G-1 | 153 | 2010 ± 30 | 90-80 cal BCE<br>50 cal BCE-60 cal CE |
| G-1 | 164 | 2030 ± 40 | 160 cal BCE-60 cal CE<br>90-80 cal BCE |
| Ramaditas | 17 | 2240 ± 30 | 390-340 cal BCE<br>320-200 cal BCE |
| Ramaditas | 41 | 2240 ± 30 | 390-340 cal BCE<br>320-200 cal BCE |
| Ramaditas | 41 | 2030 ± 30 | 220 cal BCE-30 cal CE<br>40-50 cal CE |
| Ramaditas | 9 | 2130 ± 30 | 350-320 cal BCE<br>210-90 cal BCE<br>80-50 cal BCE |
| Ramaditas | 51 ext | 1980 ± 30 | 40 cal BCE-80 cal CE |
| G-2 | 2-137-1-5-1B | 2200 ± 20 | 357-137 cal BCE |
| G-2 | 3-137-1-5-5A | 2470 ± 20 | 749-404 cal BCE |
| G-4 | 4-G4-2-6-P | 2430 ± 20 | 728-396 cal BCE |
| G-4 | 5-G4-3-7-1E | 2470 ± 20 | 749-404 cal BCE |
| 01GUA027 | UE11-Capa E | 2290 ± 30 | 325-209 cal BCE |
| Mont. Ramaditas | UN7-2 | 2280 30 | 326-208 cal BCE<br>391-341 cal BCE |

Table 2. 2. Radiocarbon dates for the Guatacondo Valley (Courtesy of Fondecyt Projects #1130279 and #1160045).

## Building material networks across time and space

While traditional interpretations of the Formative Period insist on the importance of the village as a material marker of the transition to economies of food production, and as a reflection of modes of social organization that begin to show the earliest manifestations of social hierarchization, what an archaeology beyond the house shows is that everyday life was not confined to the space of the village. The material record of the *pampa* demonstrates that a series of mundane activities, like spinning fibers, food processing, toolmaking, eating, were happening outside of towns. We can suggest a pattern of occupations related to everyday activities that were being carried out under *algarrobo* trees that provided shelter from the sun, but that were also conspicuously used as a source of food and timber. Not only were people traveling to other locales in the desert, in a constant dynamic of trade, exchange, and seasonal journeys, but they were also creating a landscape of sociality that oscillated between places within the valley. Everyday life unfolded under *algarrobo* trees, in and around cultivation plots, out in the fields, through the constant circulation of people, and in places that had been until now rendered unimportant for understanding the social life of these groups.

Our survey also shed light on the position of the valley vis-a-vis regional systems of travel and trade, adding to a larger history of archaeological investigations that have thoroughly documented circuits of mobility and caravan trade that connected the coast, pampa, and the Andean foothills (Ballester and Crisóstomo 2017; Ballester and Gallardo 2011; Borie et al. 2017; Blanco et al. 2017; Briones et al. 2005; Briones 2006; Cabello et al. 2020; Cases et al. 2008; Clarkson and Briones 2001; Gallardo et al. 2017, 2021; Knudson et al. 2012; Núñez and Dillehay

1995; Pestle et al. 2015b; Pimentel 2009, 2012; Pimentel et al. 2010, 2011, 2017; Torres-Rouff et al. 2012b). Meighan (1980:126) had already noted that G1 “was on a well-travelled path of contact between coast and highlands”, manifested not only in the presence of marine resources like fish and shellfish, but also by images or icons that travelled across Tarapacá during the Formative period. Cabello and Gallardo (2014) have identified three motifs at the neighboring rock art site of Tamentica that, given their redundancy and variability, are considered key icons of the Formative period in Tarapacá, becoming widespread across the region (Figure A.3). These icons appear in basketry at the cemetery of Topater, in personal ornaments found in Northwestern Argentina, on hallucinogenic snuff trays in the cemetery of Coyo Oriente (San Pedro de Atacama), in rock art of the Pacific coast, and repeated in geoglyphs found across Tarapacá and Atacama.

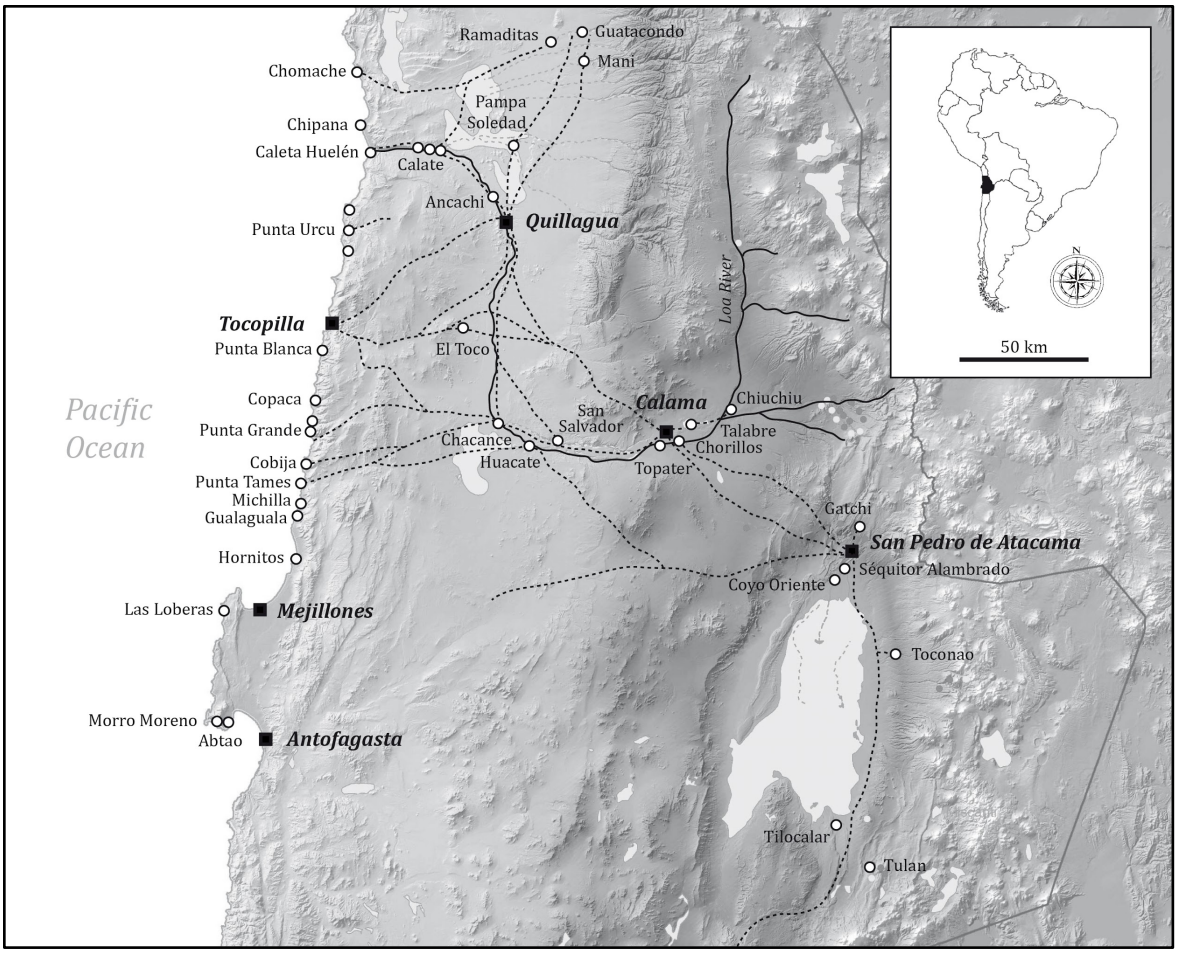


Figure 2. 15. Documented regional routes that connected Guatacondo with the coast and the valleys and oases of the interior in the Formative period (From Gallardo et al. 2021).


Figure 2. 16. Representations of the manned sea lion skin raft from the Formative period site of Tamentica (Guatacondo valley), and in an illustration made by Feuillée 1725 (Vol II, p. 592). The figure travels widely through the region beginning in the Formative period.

The concern with houses and household has a long history in anthropology. Often, houses are considered more than physical structures, underpinned by a series of claims about the structure of the families that inhabited them, gender roles, and ideas about domesticity that are fundamentally modern and Western. And although ethnography has offered multiple examples of family arrangements that do not correspond with the heterosexual, monogamous couple that is at

the basis of our social organization, it is generally assumed that by exploring households, archaeologists will gain access to the domestic sphere, and through it to the domain of the everyday. And while descriptions of the Atacama have insistently painted a picture of a desolate, empty landscape, characterized by its isolation and backwardness, overburdened by Nature, a material exploration of the *pampa*—a concept that I deploy to move away from the word "desert" and its modern connotations—clearly demonstrates the complexity of intra and inter-valley connections. Materials like ceramics, spindle-whorls, algarrobo pods, fibers, minerals, agricultural tools, among many others, flow in and out of buildings, through and beyond the valley. The material record of the *pampa* contests these narratives of settled life by demonstrating that isolation, marginality, and emptiness are qualities that do not map onto this particular landscape.

## CHAPTER 3. Deconstructing villages: microscopic elements, big assemblages

*The human history of the Atacama Desert is a history of man's taking advantage of favorable conditions when and where they occurred, and of shifting and adapting human populations responding to small but crucial changes in the environment.*

- C. Meighan, "Prehistoric Trails of Atacama", 1980.

This chapter offers a reorientation of the ways in which we understand and engage with technology in archaeology. I present a case study that focuses on the material connections between builders and buildings, a relationship that highlights the intimate imbrication of human and material agencies at multiple scales, to illustrate the inherent social nature of the organization of architectural projects. The chapter explores materials, techniques, and operations that make up the construction process of earthen architecture in the Guatacondo valley. It queries patterns of similarity and difference in architectural practices, while moving between scales—from the elemental structure of building materials to the assemblage of people—using compositional and typological lenses to characterize two key operations that are part of earth construction: the preparation of soils and the assemblage of walls. I explore these operations under the premise that they are not simply activities that carry functional weight, but that they manifest culturally specific forms of organizing technical knowledge and mobilize the social. Simultaneously, these operations worked as part of material infrastructures and territorial networks that created long-lasting attachments to places and to other humans, shedding light on the historical character of building practices.

The first part of the chapter centers on the study of the architectural techniques, or "operations of construction", deploying the framework of *chaînes opératoires* to characterize coordinated actions and technical gestures in the building process. My examination of operational sequences in wall assembly suggests at least three technical arrangements, or architectural variations, combining two different techniques: the use of modules (mud bricks or adobes); and the use of non-modular techniques (mud balls). While at first glance the sites in the valley give the impression of homogeneity, with mostly circular, semi-subterranean enclosures clustered around patios or common spaces, the examination of operations of construction demonstrates that the organization of the social body around building was not monolithic, and demanded different ways of managing time, skills, and cooperation.

The second part of the chapter describes the physical and chemical qualities of soils employed for construction to define potential "operations of selection". This analysis is based on a body of literature that combines material studies, structural engineering, and conservation, which provides the analytical language for the characterization of the material qualities of soils. The mechanics of soils serves as a point of departure for the exploration of archaeological sediments used in the construction of four sites in the valley: Ramaditas, Guatacondo-1, Guatacondo-2, and Guatacondo-4. They all share construction materials, using a combination of mud and stones (and often wood) to form circular enclosures of variable sizes and layouts. Combining granulometry and petrography, the microscopic exploration of soils employed for construction was designed to establish similarities and/or differences with soils found naturally in the ravine, and to ascertain whether soils with specific qualities were selected according to the use of modular or non-modular techniques. The results, however, show no significant distinctions between soils used in their plastic state and soils used for manufacturing modules,

while all the samples analyzed yielded no apparent compositional differences vis-á-vis the natural soils of the ravine. Comparisons with the process of ceramic production further demonstrates that building did not involve an analogous process of soil selection, making use of a material that was readily available in the landscape after the seasonal rains of the Austral summer.

Based on these material explorations, the chapter offers insights into the ways in which the knowledge of soils (pedological) and construction techniques (architectural) were locally organized and deployed in synchronicity with broader seasonal cycles. Building required coordination and proximity, while simultaneously demanding the recurrence of these practices in time and space in order for these places to endure—bringing together different generations through building acts. I argue that these are practices that *assemble the social* because they refer to a collective body of knowledge that is premised on situated and contingent practices that necessarily required cooperation, while accruing history by virtue of their recurrent materialization in space. In other words, I consider the social body as a *historical assemblage* that is partially materialized as such through a set of recurrent tangible connections that extend across space and time; building being one of the best examples of how a technological practice actively assembles the collective engaged in its production. By way of conclusion, I suggest that without the implementation of the architectural project, these communities cease to actualize their attachment to place through these recurrent building acts, resulting in a process of abandonment.

## On the Ubiquity of Mud

People in Guatacondo have long been subjected to yearly mudslides that provoke road blockages, the destruction of agricultural fields, the loss of animals, homes, and other material goods. What is commonly known as the “Invierno Boliviano" marks a season of torrential summer rains in the highlands—above 3500 m.a.s.l—that can trigger the rapid activation of usually dry riverbeds, transporting sediments that flow down these narrow canyons before they reach and overflow the plains of the *Pampa del Tamarugal* (PDT). What we currently think of as “natural disasters” leave behind is a noticeable abundance of fresh mud, in what constitutes a dramatic cyclical remaking of the landscape[1]. The relationship between these environmental cycles and the organization of cultural practices has been well documented in the ethnographic literature of this part of the South-Central Andes. In his survey of the province of Tarapacá in 1828, William Bollaert describes such events: “when thunderstorms with their heavy rains occur in the Andes, great torrents or *avenidas* rush down the ravines, bringing with them masses of rock, tress, huts, cattle, indeed all that may be in their way—leaving, after one of these sudden and destructive floods, nothing but a bed of stones” (1851:104). Today, these events tend to be highly destructive, causing the collapse of infrastructure and basic services in rural towns and villages. At the same time, they recharge subterranean aquifers and springs that sustain small-scale agriculture in the area and feed the alluvial fans that allow the current survival of slender patches of desert forests. This cyclical phenomenon is generative as much as destructive, and indeed, as I argue here, was central to the organization of architectural projects carried out by the social groups behind the construction of the sites of Ramaditas, G1, G2 and G4.

[1] Here, I understand *landscape* to be the product of a social process, broadly construed as *hybrid assemblages*, acknowledging that there are “other-than-human” elements that have their own efficacy and work with and beyond the human (Richard 2018). Architecture, in this context, is only one material manifestation of the ways in which landscapes emerge and transform.

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Pottery appears in the archaeological record around 2700 BP, while the earliest dates available for earthen architecture cluster around 2500 BP (Uribe and Vidal 2012). Both technologies make use of mud in different ways but are examples of the proliferation of ways of transforming this material into objects of everyday use. Indeed, fresh mud was also used for manufacturing spindle whorls, miniature vessels, anthropomorphic figurines, and lids (Figure 3.1). The evidence suggests that this new materiality saturated the spaces of everyday life, and that people who lived and worked together in the valley shared a particular knowledge about the properties and uses of soils. Beyond the practicality of using a widely available material, it is relevant to also attend to the qualities of mud as a plastic material, which can inform interpretations about possible technical choices that are not tied to functionality[2].

Ceramic studies offer methodological considerations for the archaeological study of soils, but also serve to draw comparisons between these technologies, defining quite distinct fields of practices and skills that make use of mud in very particular ways. Research in this field has shown that around 2700 BP there was already a stock of knowledge associated with the management and use of soils (dry and fresh) to produce containers. This early industry, known regionally as the "Loa Café Alisado" or LCA type, has a distribution through and beyond the PDT, from the coast of the Pacific to the Andean highlands. It is represented, with some

[2] As Love (2013) has suggested in her studies of mudbrick architecture in the Neolithic site of Catalhöyük, the malleability, fluidity and flexibility of mud have the capacity to create different textures and appearances that other materials, such as stone, do not possess.

exceptions, by vessels that show a diagnostic thickening of the rim—usually referred to as "borde en coma" (comma rim), a technical element that probably replaced handles (Agüero et al. 2006; Uribe and Ayala 2004; Uribe 2006; Uribe and Vidal 2012, 2015). The pastes are compact and homogeneous, exhibiting white, angular, and rounded mineral inclusions. Surface treatments include the smoothing of both the interior and exterior of the vessels, while some examples show red spots probably derived from the application of a thin slip. A set of thermoluminescence dates from different sites of the PDT (in the Tarapacá and Guatacondo valleys, and the oasis of Quillagua) firmly place the LCA type within a range that extends from 730 BCE to 695 CE. Similarly, the petrography of 65 samples of three different types of local ceramic traditions revealed that all but one of the LCA sherds analyzed were part of the same petrographic group, suggesting that similar mineral formations were selected to manufacture this pottery (Uribe and Vidal 2015). Authors have suggested that since the production of LCA pottery followed a standardized recipe and has yielded similar chemical signatures—indicating specific sources of raw materials or center of production—manufacturing practices were part of an "orthodox" body of technical knowledge, probably in the hands of skilled potters.

Correa and collaborators (2018) have demonstrated that between 2500 and 1200 cal. years BP, LCA pottery was heavily consumed along the coast of Atacama—primarily in funerary tumuli built by fisher-gatherers who were not pottery producers themselves. In contrast to the interior, on the coast LCA vessels show traces of exposure to open fire, signaling their use as cooking ware in addition to their funerary function. This use is further demonstrated by the correlation between LCA vessels and the presence of different starch grains with taphonomic traces that indicate grinding, peeling, and cooking of *Phaseolus* sp., *Chenopodium quinoa*, and other Chemo-Ams. Given that both cultigens and ceramics were produced in the interior, their

frequency in sites located ~200 kms away from probable centers of production speaks to the complex networks of circulation and exchange of valued goods articulated during this period. These circuits provided connection between the coast of the Pacific, the desert interior, the narrow valleys of the Andean foothills, riverine oases, highlands, and the eastern flanks of the Andes (Gallardo et al. 2017; Pestle et al. 2015; Pimentel 2013; Torres-Rouff et al. 2012). In the interior, the evidence reported so far indicates that these vessels were used in domestic contexts, mainly as containers and not as cooking ware (Uribe and Vidal 2012). The homogeneity of paste recipes and vessel forms contrasts significantly with the wide regional distribution and the uses that different populations made of these objects.

Figure 3. 1. LCA vessels recovered in Ramaditas (Canchones Collection, U. Arturo Pratt).

The engineering of a world that did not exist prior to 2500 cal. BP was made possible by the availability of mud and the creative and technical skills that people developed in order to work with this material. To address the technical aspects of architectural projects in Guatacondo—and understand their design, execution, and variability—I use the framework of

the *chaînes opératoires*, a tool that facilitates the analytical "cut" of what was, in practice, a series of actions within craft. This method considers that the transformation of raw materials into objects can shed light on "the physical actions and material procedures by which ancient technicians procured, prepared, modified, altered, shaped, used, repaired, reworked, recycled, and ultimately discarded their material culture" (Dobres 2000:168). Following Dobres (2000), these are aspects that provide access to technical stocks of knowledge, skills, competence, and reveal the constraints and possibilities inherent in the chemical, mechanical, or other physical properties of the material being worked. The analysis of "operational sequences" seeks to reconstruct the organization of a technological system by focusing on the ways in which a raw material is made into a usable object. It works both as a temporal and spatial segmentation of the complex process of making and using things. French archaeologists popularized this notion (e.g., Lemmonier 1983, 1992; Leroi-Gourhan 1964; Pelegrin et al. 1988) in the study of the relationship between material procurement, tool manufacture, use, maintenance, and discard—or the "life trajectory" of tools (Sellet 1993:107)[3]. The analysis presented here also takes insights from practice-based studies of technologies that highlight the social efficacy of collective activities like collecting raw material, cutting trees, digging soil, and assembling walls, considering that these actions involved bodily dispositions and coordinated performances that created communal sensibilities (Dobres 2000; Pauketat and Alt 2005; Pelmoine and Mayor 2020; Roddick 2013; Roddick and Hastorf 2010).

[3] A similar use was mobilized independently by American archaeology, perhaps most notably by Schiffer's analysis of "behavioral chains" (Schiffer 1972, 1978). While in American archaeology it was deployed as part of the theoretical project of processualism, the French approach employs it as an analytic that is useful for delineating the material changes of ancient technologies (Sellet 1993).

## The architecture of Guatacondo 1 and Ramaditas

Ramaditas and Guatacondo 1 (G1) are two of the biggest and best-preserved sites with earthen architecture in the Atacama Desert. The other two sites included in the analysis, Guatacondo 2 and 4 (G2 and G4, respectively), also make use of mud for construction but exhibit different spatial layouts and placement. The aerial portions of walls in G2 and G4 have not been preserved, so techniques of wall assembly could not be documented, but the lower portion of the walls are still visible (Figure 3.2). Other archaeological features that are present in the better-studied sites of Ramaditas and Guatacondo 1 are absent here, such as the clustered semi-subterranean enclosures with circular floor plans. Radiocarbon dates obtained from G2 and G4 range from ~2700 to 200 cal. BP, indicating a contemporaneous occupation of all four sites, probably with some fluctuations at generational scales.

G2 is located on the northern terrace of the ravine, among an intricate network of irrigation canals and agricultural fields. It is formed by two adjacent enclosures of approximately 150m$^2$ each. The ubiquitous semi-subterranean, circular, aggregated pattern is absent here, showing instead a floorplan or irregular shapes, without standing walls (Figure 2.6). G4, located approximately 1 km west of G1, contains eight circular enclosures dispersed around a central sub-circular structure of approximately 850m$^2$. Walls are not observable at this site either, but samples were extracted from segments of the central structure, which was built with mud and stones (Figure 3.2). G4 is associated with an extensive lithic workshop, first reported by Mostny (1970).


Figure 3. 1. Aerial view of G4, obtained using an UAV.

G1 is the biggest settlement, made up of around 180 circular enclosures distributed around a large central space that covers a surface of approximately 1000m$^2$ (Figure 2.3). Most enclosures (62.7%) are of sizes that range from 5 to 20 m$^2$, 17% are smaller than 1 m$^2$, and almost 15% are bigger than 20 m$^2$. Only 2% of the enclosures have sizes above 60m$^2$ (Urbina et al. 2012). Meighan's excavations at G1 revealed the existence of storage pits excavated in the house floors. Although intact content was not recovered, except for occasional lima beans or *Prosopis* seeds, the frequency of the latter led the author to argue that the primary commodity stored in G1 was not cultivated but gathered in the neighboring forests of the PDT (Meighan 1980). Other wall materials described in Meighan's study include large basal stones, with courses of small stones near the top of the walls, as well as *Prosopis* branches that were set into

the walls themselves. He reports that center posts were present in seven structures, and roofs were manufactured with poles, reeds, and occasionally a clay cap. Individual enclosures were accessed through narrow doors, and the only additional external feature of these enclosures was a small opening or "window" near the top of the wall.

| Site | N° | Surface (Ha) | Floorplan (%) | | |
|---|---|---|---|---|---|
| | | | rec | curved | n/o |
| Ramaditas | 83 | 9.23 | 3.6 | 96.36 | - |
| G1 | 177 | 0.78 | 9.58 | 88.1 | 2.5 |
| G2 | 4 | 0.06 | 25 | 75 | - |
| G4 | 8 | 0.2 | 12.5 | 87.5 | - |
| TOTAL | 272 | | | | |

Table 3. 1. Number of individual buildings recorded.

Ramaditas extends along the northern terrace of the mouth of the Guatacondo valley, right where the ravine meets the plains of the PDT. Buried tree trunks, cultivation plots, and canals dot the landscape, signaling the existence of old *Prosopis* forests and superficial run offs that were managed to water fields used to grow quinoa, gourds, and beans, principally. Systematic studies of the site describe it as a complex settlement with at least three separate conglomerates, numerous domestic buildings associated with agricultural fields, and at least one large mound (Figure A.3.1) (Graffam et al. 1996; Rivera 2005; Rivera et al 1995/1996). Aerial explorations and pedestrian surveys have revealed at least two additional complexes that have yet to be investigated. The semi-subterranean enclosures were built combining mud balls, hand-molded mud bricks, and stones. Large basal stones placed as wall foundations have also been documented for Ramaditas, specifically for the bigger circular buildings of Compound 1 (C1).

Urbina and collaborators (2012) indicate that most of the enclosures range from 5 to 20 $m^2$ (61%), 16% are smaller than $5m^2$, and 16% are bigger than 20 $m^2$. Buildings above $60m^2$ are more frequent than in G1 (8.5%), but the density is significantly lower in Ramaditas, indicating a much less aggregated site. Martindale (2005) suggests that buildings were made from walls of alternating courses of mud bricks and stones, held together with mud mortar that was applied wet. He notes that "the adobe bricks do not appear to have been formed in regular molds; they may in fact have been *chipped out of layers of naturally formed hardpan*, which is the most common ground surface in the desert" (Martindale 2005:147. Emphasis added). An earlier publication mentions that the walls of Compound 2 (C2) were made with blocks of *caliche,* a calcium carbonate cement that is ubiquitous in the PDT. While authors seem to agree that the bricks used for construction in both Ramaditas and G1 were obtained from natural deposits rather than produced with prepared soils, the use of the term *adobe* and the inconsistent description of construction materials and its social implications reflect the superfluous understanding of architecture as a world-forming technology. As the following sections demonstrate, differences in technique entailed distinctive processes of materialization with particular ways of managing time, building rhythms[4], and the mobilization of builders. In this work, I use the distinction between modular and non-modular techniques as the main technological trait for establishing differences in operations of construction. Based on the physical and mechanical properties of soils, I elaborate on certain material properties of mud to consider the potential manipulation of soils for preparing the mixture used in construction.

[4] Building rhythms is a term I employ to refer to the synchronization and chronological organization involved in assembling a wall.

## Operations of Construction: Mud balls, Mud bricks, and Mortar

Ethnography, as well as material, architectural, and conservation studies, have shown the variability and technical expertise of earthen architecture, highlighting its wide availability, adaptation to variable climatic conditions, and sustainability (Chazelles and Poupet 1985; Chazelles et al. 1985; Cooke 2010; Guerrero-Baca 2007; Guillaud at el. 1995; Houben and Guillaud 1994; Kemp 2000; Minke 2013; Rivera-Torres and Muñoz-Díaz 2005; Rivet and Tomasi 2011). Archaeology, however, has often paid too much attention to monumental earthen constructions at the expense of ordinary mud constructions, or what has been typically referred to as "vernacular" architecture (Buchli 2013; Cooke 2010; Rapoport 1969). Some scholars have noted that the lack of archaeological studies on the subject is partially due, aside from the emphasis on monumentality, to the poor conservation of mud architecture and the problem of terminology, which has favored the obfuscation of various construction techniques that tend to be subsumed under the concept of "adobe"—such as rammed earth, wattle and daub, and other methods that involve undried kneaded soils (Cooke 2013; Friesem et al. 2011; Guerrero and Uviña 2018; Pelmoine and Mayor 2020; Sánchez García 1999). The versatility of mud results in a wide array of uses and techniques, which in part explains why it has been and is still employed as a construction material in many parts of the world. This fact has also made it difficult to generate a standardized conceptual apparatus that can capture such cultural and geographical variability, and especially to make operational categories possible for archaeological investigations.

Studies in French and Spanish (e.g., Chazelles and Klein 2003; Chazelles and Poupet 1985; Houben and Guillaud 1994) have provided most of the vocabulary for the study of earthen constructions in Latin America and the Mediterranean. Not many have attempted to recognize

techniques in archaeological contexts, but among them, different authors have focused on slightly different criteria for establishing material signatures with archaeological viability (Cooke 2013; Gama-Castro et al. 2012; Goodman-Elgar 2008; Pastor-Quiles 2016, 2017; Pastor-Quiles et al. 2019; Pelmoine and Mayor 2020; Sánchez García 1999). Based on pre-Roman material from the Iberian Peninsula, Sánchez-García (1999), for example, begins by differentiating between soils that are used in their natural state, and those that are prepared prior to being used. Natural or prepared mud can be kneaded and used in the same location of construction, but through its transformation into modular units (sun-dried earthen blocks), it can be transported, stacked, stored, and manipulated individually. In this sense, the kind of soil used—natural or prepared—does not necessarily determine the technique employed, which will depend on the adaptability to the climatic and geographic environment, cultural choices, and technical knowledge (Sánchez-García 1999:164). According to the author, soils can be used in multiple ways: to make individual modules, typically called *adobes* or mud bricks; and as part of non-modular techniques that use soil in a plastic state (kneaded earth) or to form a homogeneous mass, such as rammed earth. Sánchez-García (1999) also identifies "mixed techniques" that combine earth with other material, such as vegetal fibers or wooden posts—for example, wattle-and-daub (Chazelles 1997). Because in these cases mud is applied in its plastic state, it is often possible to see hand marks or fingerprints that are left when surfaces are smoothed.

Other authors draw distinctions based on the structural function of mud. In their study of earthen architecture in Bronze Age sites of the Iberian Peninsula, Pastor-Quiles and collaborators (2019) make an analytical distinction between "mixed techniques", where mud bears none of the structural load (e.g., wattle-and-daub), and "massive earth" techniques—in which mud does play a structural role (e.g., rammed earth). Earth constructions that employ modular units are part of

the massive earth techniques, the most common examples being adobes, sod blocks, and cob balls (Pastor-Quiles et al 2019:214). The authors employ morphological criteria to recognize modules in archaeological contexts: they preserve their original shape, which indicates a drying period. Similarly, Cooke (2013) establishes a typology based on the structural function of mud: 1) Load bearing construction, where walls are designed to support additional weight (such as ceilings or roofs). This first group includes mud bricks, rammed earth (also known as "pisé" in French, and "tapial" in Spanish), and placed earth or cob. 2) Non-load bearing construction, where mud has no structural role, for example, wattle-and-daub (Cooke 2010, 2013).

For this study, the main technical distinction was based on the way in which mud was used for building purposes: to produce blocks or modules; or in its plastic state, which did not require a process of molding and drying. Modular units were identified by shape: solid, regular blocks that did not lose their shape once they were laid on a course. For non-modular techniques, archaeological markers include finger or hand marks that were left during the construction process, or by mud balls of kneaded earth that lost their shape after they were laid on the wall. In this sense, morphology was used as a direct indicator of the existence of a drying process. Mortar—the mixture of aggregates (sand and/or fine gravel) with a binding agent and water (Guillaud et al. 1995:24)—was employed for the mechanical bonding of modular units.

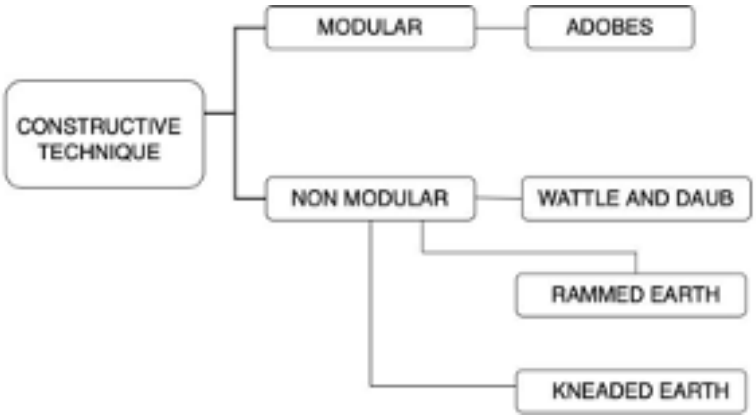


Figure 3. 2. The main technical distinction for the analysis was based on morphological traits to distinguish between modular and non-modular techniques.

Both techniques co-exist in the valley during the period under study, although only kneaded earth is used extensively, making it the preferred method for earthen constructions. Following the operations that make up the technical sequences of wall assembly, three different techniques or architectural variations were identified: two that make use of mud in its plastic state, and one that makes use of modules—although it is notably exceptional and, so far, only found in Ramaditas (Figure 3.4).


Figure 3. 3. Variations in mud architecture at Ramaditas, showing non modular (A-B), and modular techniques (C): Compound I, Mud balls and stones (A); Compound II, Stones used as modules with mortar (B); Compound III, Mud bricks with mortar (C).

Given that Ramaditas is the site where walls are better preserved, the variations were established based on the complete architectural documentation of the site, recording the main features and metrics in a standardized sheet (Figure A.4 and A.5). Some of these variations were also identified in G1, based on the published material of the excavations carried out at the site (Meighan and True 1980), as well as our own investigations.

The variability was determined by the combination of two basic ingredients (stones and mud) and the ways in which they were arranged in the wall structure: the first one (A) combines

fresh mud balls and stones of different sizes, following a cellular pattern of assembly, with no visible courses. A second variation (B) uses the same materials but assembled in a manner that slightly resembles common masonry techniques, with visible, organized rows of stones placed at intervals. A third clear variation (C) combines earth modules and mortar, without using stones, or employing very few. This variation is clearly less common in Ramaditas and has not yet been identified clearly anywhere else in the valley. The size of each module is variable enough to strongly suggest that they were not manufactured using molds, but probably extracted as blocks from natural deposits. It is important to note that sometimes there are differences between sections of the same wall, so the variations constitute a range of possibilities rather than specific types.

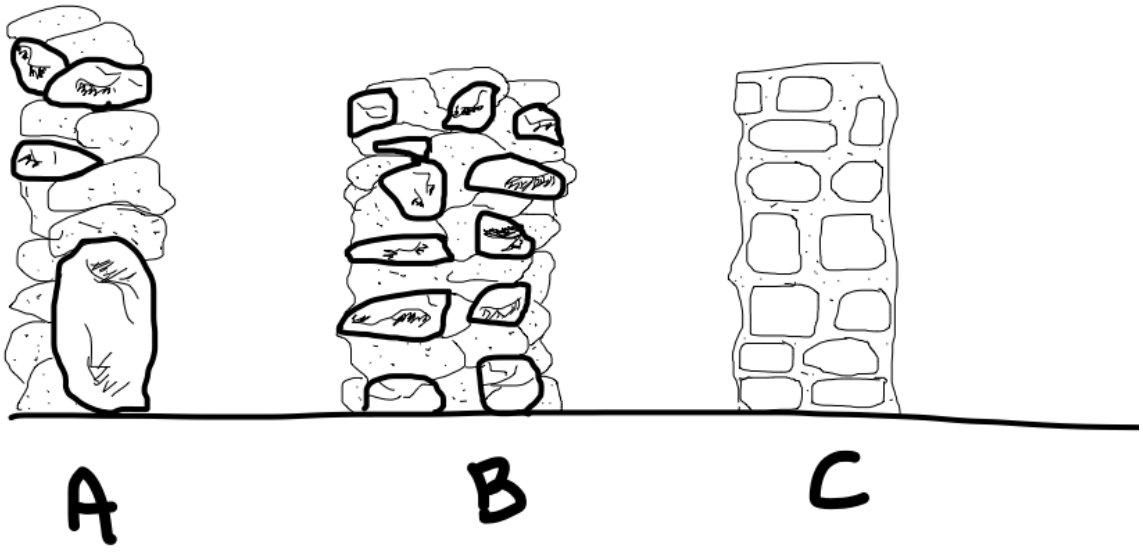



Figure 3. 4. Schematic representation of three architectural variations identified in Ramaditas.

The first two variations are described in detail in the next section, while the third variation (C) is characterized under “Modular techniques”. The importance of these distinctions

lies in the fact that the variations in wall assembly have different demands on the coordination of the building process and, consequently, in the organization labor involved in its production. The next sections describe these differences by providing reconstructions of operational sequences when modular and non-modular techniques are employed, highlighting the material demands that these variations entailed.

**Non-Modular Techniques**

Non-modular techniques include a wide variety of earthen constructions that employ mud and other materials to form homogeneous walls whose elements cannot be manipulated individually. Among them, the most well-known types are wattle-and-daub[5], rammed earth[6] ("pisé" or "tapial"[7] ), and kneaded earth ("amasados" [Sánchez-García 1999]). Kneaded earth (*tierra amasada*) is the most ubiquitous form of building in the valley of Guatacondo. It has been

[5] Wattle-and-daub combines a woven lattice, wooden frame or other kind of formwork that functions as the main support of the wall, using a moderately wet earth mixed with a stabilizer that is then applied to the armature in layers or balls, smoothing the mud and covering the joints with hands or tools (Cooke 2013; Sánchez-García 1999; Pelmoine and Mayor 2020).

[6] This technique has been identified in the archaeological record in places like Jericho, dated at 9700 to 8800 cal years B.C. (Finlayson et al. 2010:8186). Rammed earth is a type of unbaked earthen construction that is formed by compacting moist soils inside a temporary formwork (Walker et al. 2005). It uses a relatively dry mix of soils (Cooke 2013:71), which is poured into the frame until compacted. The formwork is then removed, and the wall dries out before the next section is added. The task of compacting the soil requires two or more people to compress the formwork on both sides and above, which requires certain synchronicity (Sánchez-García 1999:170). The soils need to have granulometric variability and low moisture. They do not require the addition of vegetal matter, since there is less shrinkage to counteract, and the stabilization of soils is achieved by pressing the formwork against the mixture—eliminating extra moisture and increasing the density of soils (Sánchez-García 1999:170).

[7] In Spanish, "Tapial" is defined as "el molde de dos tableros paralelos en los cuales se forman las tapias", the word "tapia" meaning "cada uno de los trozos de pared que *se hacen de una vez* con tierra apisonada" (*Diccionario de la Real Academia de la lengua Española* [online]. Emphasis added). Tapial refers to the wooden support that is used to compact the soil (Sánchez-García 1999:169).

described as a technique that employs a moderately wetted soil that is worked until soft and plastic and used directly in the edification of walls without pre-constructing or drying (Cooke 2010). When walls are erected with humid or wet materials, mortar is not necessary and the surfaces can be smoothed using wooden tools or hands, leaving marks that can often be detected archaeologically (Pastor-Quiles et al. 2019). In two of the sites studied, G-1 and Ramaditas[8], kneaded earth was often combined with stones to produce at least two variations of wall assembly (Figure 3.6).

[8] G-2 and G-4 have no aerial portions of the walls visible, so other than the fact that both elemental materials are present, the identification of particular architectural variations was not possible.

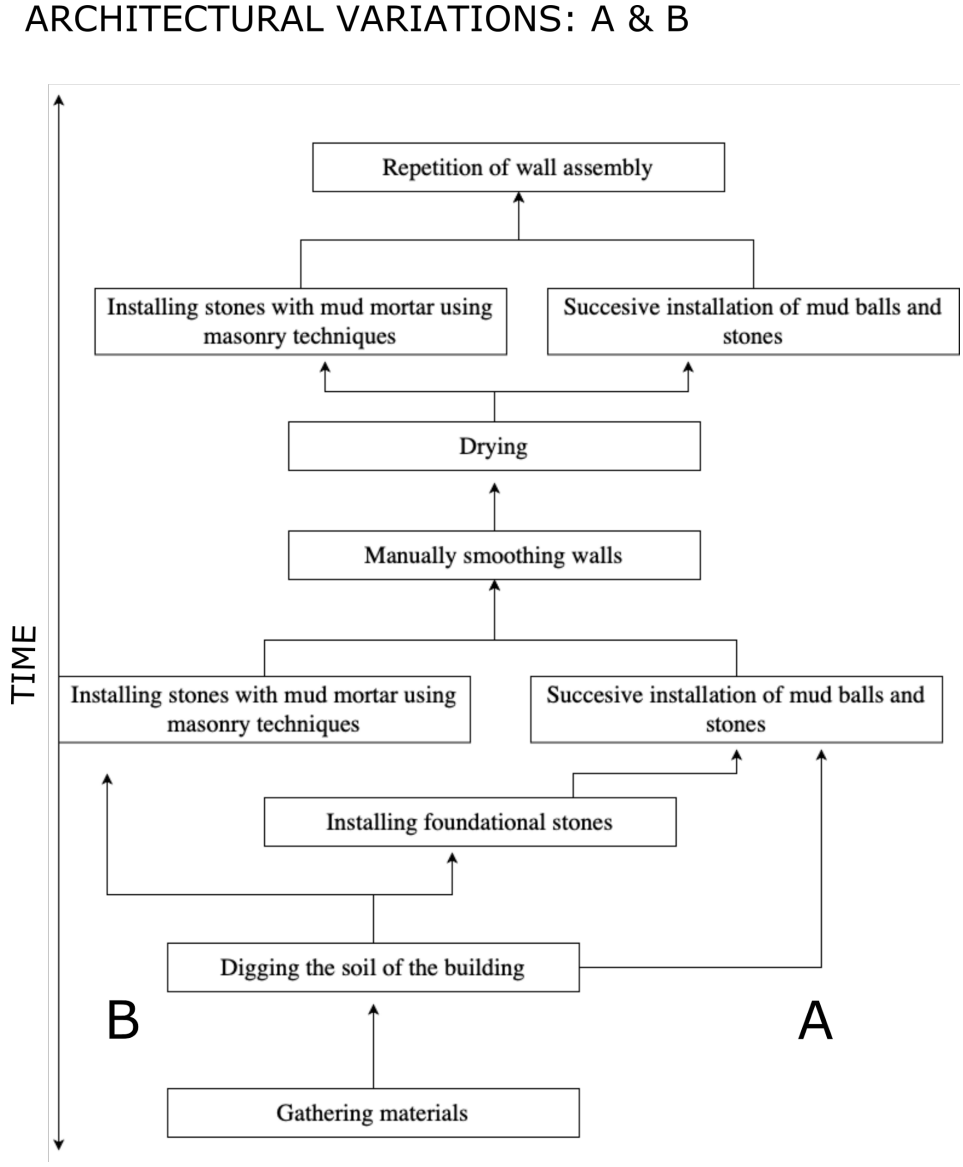



Figure 3. 5. Most buildings in Ramaditas and G-1 were constructed following similar sequences, but with clear variations in the arrangement of elemental materials (stones and fresh mud balls). Both variations relied on the availability of fresh mud.

At the construction site these variations began with the preparation of the building surface, excavating a pit that served as the source of the mud used for the walls. In some cases,

stone slabs were placed against the contours of the excavated pits to provide stability[9], and to support the aerial portion of the wall. These two variations can be clearly distinguished by the mud:stone ratio, and the way the elements are arranged: in variation A—well represented in Compound I of Ramaditas, which concentrates some of the largest buildings of the valley—there is no clear intention to arrange the constructive elements in courses, while variation B closely resembles the principle of masonry, with the constructive elements arranged in visible rows. In the latter, stones work as modules, laid in and bound together with mortar. Performing one action or the other required distinctive forms of synchronization, because the elements of variation B are assembled horizontally before moving vertically. Each course had to be relatively set before placing the next one, in order to preserve its structural stability. Variation A, on the other hand, did not require the same kind of building rhythm, privileging instead a "quick assembly", where the constructive material is not pre-dried. The size and quantity of stones increased the wall's mass, permitting its vertical growth. In fact, this seems to be the preferred method for the construction of large buildings (Compound I). It is relevant to note that these variations worked more as architectural options rather than distinctive types, since there are multiple cases where both arrangements were combined on the same wall (Figure 3.7).

[9] Studies of vernacular architecture in the Andean highlands have shown that it is quite common to use stone slabs to build foundations, both to stabilize the surface and to block soil moisture (Rivet and Tomasi 2011).

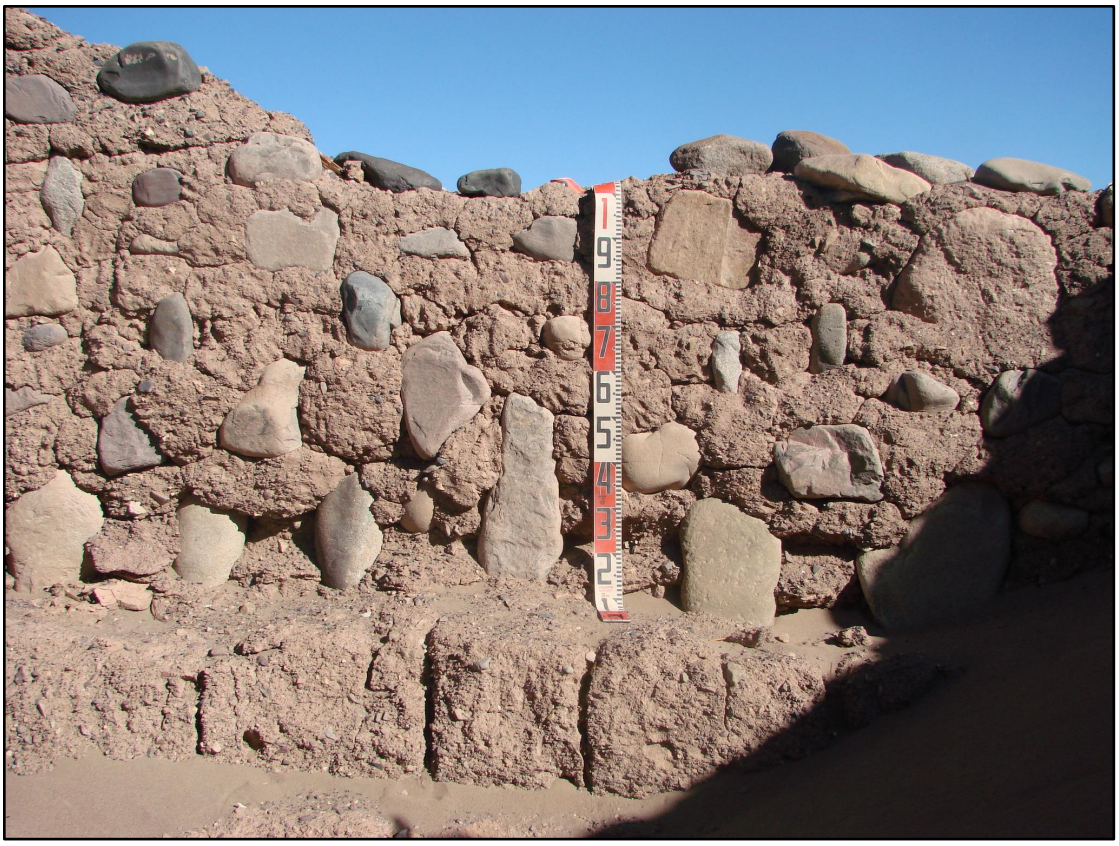


Figure 3. 6. Ramaditas, Compound I, Structure 4 (N wall), shows a long building sequence: an excavated interior surface, stones slabs that provide the foundations for the aerial portion of the wall, which combines large stones with mortar.

The widespread use of fresh mud is signaled both by the multiple finger marks and handprints left on the walls, and by the presence of chunks of mud that lost their shape after being laid on a course (Figure 3.8). This process of "quick assembly" was identified in all four sites under study, being by far the most common way to employ mud for construction.

Figure 3. 7. Detail of a modeled face on a wall in Compound I, Ramaditas.

**Modular techniques**

"Adobes"[10] or mud bricks are only of the most widely known type of earth construction. Although sometimes the word is applied for any earthen construction, adobes are sun-dried or unfired building blocks with regular dimensions (Guerrero and Uviña 2008). It is one of the most ubiquitous forms of earth construction worldwide, and one of the oldest[11]. Unlike other

[10] The Spanish "adobe" probably originates from the Arabic *attub,* or *tub(a)*, which can be traced to the ancient Egypt word for mudbrick, *djebet* (*Diccionario de la Real Academia de la lengua Española*, 2020 edition [https://dle.rae.es/adobe]; Kemp 2000). The term appears for the first time in the Iberian Peninsula in a document from 1157 (Sánchez-García 1999:172). In this work, I pluralize the word to denote more than one mud brick (i.e. *adobes*).

[11] Mud bricks are documented from the early Neolithic onwards throughout the fertile crescent, in modern day Iraq, Syria, Turkey, and Iran (Campbell and Pryce 2003; Cooke 2013; Friesem et

techniques that employ earth as a building material, mud bricks require a sequence of manufacture that often includes sourcing, mixing, molding, and drying periods (McHenry 1989). The result of this process are units that are transportable, durable, and can be individually manipulated. Mud bricks are usually made with well-mixed wet earth, which is often combined with vegetable matter, such as straw or chaff, or animal products, such as *guano* or hair (Cooke 2010; Rivet and Tomasi 2011). Once the mixture is workable, it is poured into molds or formworks with standardized shapes (Guerrero and Uviña 2018:2). Modular units can also be formed by hand, which usually yields less regular shapes that tend to be spherical, ovoid, or cylindrical (Cooke 2010:8; Pastor-Quiles et al. 2019)[12]. Other types of modular units have been reported in archaeological contexts, for example, earth blocks that can be extracted directly from a plastic matrix (Pastor-Quiles et al. 2019:215).

The literature on mudbrick-making shows that the process usually begins with the extraction and transportation of the soil that will be used for the mix. If the source is far from the building site, it needs to be stockpiled at the place of manufacture. The preparation of the soil can occur in soak pits, mixed by hand, feet, or mechanical means. There are choices between using liquid or damp mud for molding, but the mix must be uniform to prevent cracks during the drying process (McHenry 1989). Bricks are left in molds for an initial drying period that lasts until they are firm enough to handle without losing their shape. These can vary greatly depending

al. 2010). Molded mud bricks have been identified beginning in the VII millennium BC in Mesopotamia, Anatolia, and Syria, in the predynastic period in Egypt, in pre-Hispanic Mesoamerica and the Andes, and Iberia since the Bronze Age (Pastor-Quiles et al. 2019). In the Americas, adobe technology became a pervasive construction material with the Spanish colonization, heavily influencing local building cultures (Steen 1972).

[12] Hand-made adobes have been documented in different parts of the world, and it is often believed that they preceded the serial manufacture of molded mud bricks (Kemp 2000; Steen 1972).

on geographical location and climatic conditions (Bardou and Arzoumanian 1979). Guerrero and Uviña (2018:2) indicate that, after molding, mud bricks need to be exposed to air to allow homogeneous drying, and once they reach the necessary strength for handling, they are turned and dried again for a few days. In the Andean Puna, studies have reported drying times ranging from two weeks to a month (Rivet and Tomasi 2011:72), although adobes can be stored for over 10 years, or recycled from older constructions. Sheltering bricks from direct sunlight is necessary to guarantee an even drying process, and it is during this stage that the full effect of additives is manifested. Fibers such as animal or human hair, bamboo, straw, ash, among others, absorb water into their pores—reducing the relative clay content—and increase the binding force of the mixture, lowering the chances of cracking and reducing the shrinkage ratio of the brick (Minke 2013:38). Other studies report drying times for mud bricks that range from a few weeks to a full year or more before they can be employed (Campbell and Prye 2003; Cooke 2010; Guerrero and Uviña 2018; Horne 1983; Rivet and Tomasi 2011)[13]. Once the units are dry, they can be transported to the construction sites, where they can be used employing common masonry techniques.

The only case where we clearly detected the use of modules was in Compound III of Ramaditas. However, unlike what is described in the literature, the variability in sizes and shapes of the modules suggests that molds were not employed. Therefore, we are facing a different production process: morphologically, the modules used for construction indicate that they were extracted directly from the soil (Figure 3.9).

[13] In his building treaty “The Ten Books on Architecture ", Roman architect Vitruvius prescribes that mud bricks should be made in Spring or Autumn so that they can dry uniformly. Bricks made in the Summer, for instance, are defective because the intense heat of the sun bakes their surfaces rapidly, but not their interior. This causes cracks to appear, making the brick weak (Vitruvius 1960:43).

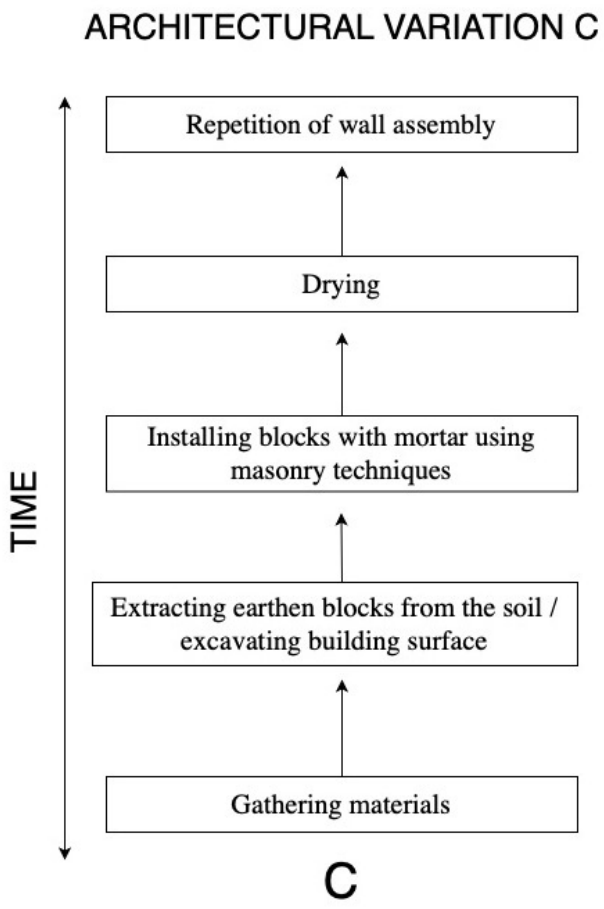



Figure 3. 8. Architectural variation C. Working with modules would afford shorter assembly sequences by allowing the mud to dry in situ, and then extracting earthen blocks directly from the site of construction.

Given that this scale of analysis was based exclusively on morphological attributes, we performed microscopic examinations of the soils used for construction, in order to identify if there was a selection or preparation process of the matrix. Earth elements of the three architectural variations were sampled to look for potential differences in their soil composition. Mud balls, mud bricks, and mortars were microscopically examined under the premise that earthen architecture, whether it is through modular or non-modular techniques, often involves a process of preparation of the mud mixture before it can be used. This implies a series of operations that must take place prior to building, making the technical sequence more complex in

terms of time, skills, and the people involved in the process. The next section explores the methods of analysis and results of the compositional study of mud samples from the archaeological sites of Ramaditas, G1, G2, and G4.

## Operations of Selection: Soil preparation

Historically, earth has been employed to construct a variety of buildings: monumental structures of mounded earth in the American Southwest and Southeast (Cameron 2002), camps and enclosures in Western Europe (Whittle 2003), platforms for ceremonial sites in Mesoamerica (Sharer 2006), and ancient cities in the Andes (Andrews 1974; Moseley 1975; Willey 1953) and Anatolia (Hodder 2007; Mellaart 1967; Love 2012). Earth's ubiquity as a building material is due, in part, to its ample availability as well as its high adaptability to different geographical settings. Despite this ubiquity, in non-monumental contexts earthen architecture has received significantly less archaeological attention (but see Adorni et al. 2013; Balsam et al. 2007; Chang and Beardmore 2016; Nodarou et al. 2008; Love 2012, 2013; Pastor-Quiles 2017; Pastor-Quiles et al. 2019; Spengler et al. 2010). This project was partially designed to address this research oversight by bringing together a suite of analyses that have been used for the technological exploration of ceramics, but whose potential has not been tested for other materialities that involve the manipulation of mud in the Atacama Desert.

Studies on building materials and soil science offer a relatively standardized vocabulary to account for the different mechanical, compositional, and structural modifications that soils undergo before, during, and after being utilized for construction (Cooke 2010; Guillaud et al. 1995; Minke 2013; Potter 2005). Loam is a mix of clay, silt, sand, and occasionally larger

aggregates like gravel or stones, found naturally all over the world[14]. Silt and clay are the finest products of rock disintegration and chemical decomposition, and combined, are often referred to as "mud". Sand usually results from the breakdown of rocks into their constitutive crystals, and gravel derives from fracturing of the source rocks (Douglas and McConchie 1994:114). Soil structure or texture is defined by the way in which individual particles of clay, silt, and sand are assembled. These different components are commonly identified by the size of the particles, where clay has the smallest diameter, followed by silt, sand, and gravel.

The mechanics of the loam is determined by the sand, silt, and clay content. Depending on which of the three components dominates, soil scientists and engineers refer to them as clayey, silty, or sandy loam, although they disagree on the particle size for each type[15]. Clay is what grants the mixture its plasticity, acting as a binding agent for all the other particles in the loam (Cooke 2010; Minke 2013; Potter 2005). Clays are minerals that form through the weathering of materials like feldspar, amphiboles, pyroxenes, and volcanic glass (Potter 2005:8). The different groups of clay minerals (kaolinites, montmorillonites-smectites, and illites [Houben and Guillaud 1984; Nichols 2009]) share particle size and geometry (usually a hexagonal lamellar crystalline structure), as well as water content (Minke 2013). Water is what activates the binding forces of loams, creeping between the structure of the clay minerals, enclosing them with a thin layer of water. This explains why loam swells and changes from a solid to a plastic state

[14] Loam is a byproduct of the erosion of rocks on the earth's crust, which occurs mainly because of the action of moving glaciers, water, and wind. It has a porous structure, meaning that it is a material able to store and transport water within its capillaries. Because of this capillary structure, the water content in it always travels from regions of higher humidity to regions with lower water content. Given its high capacity for water absorption, loam can be easily transformed from solid to semi-solid, plastic or liquid (Minke 2013:23).

[15] In this study, we employ the granulometric scale for clastic sediments proposed by Wentworth (1922).

when it becomes wet. Clays become hard, brittle, and non-plastic when they are dried or fired. Fire permanently alters the chemistry of clay, which is the process through which clays are transformed into ceramics. When clay is not fired, it becomes susceptible to the action of water (rain or humidity), the main reason why earthen constructions need constant care and repair. Plaster, for instance, is one of the materials used to insulate earthen structures. When the water content in the mixture evaporates, it causes the mineral structure of clay to rearrange itself in a parallel pattern, becoming tense and compressive after drying (Minke 2013:19).

Sand and silt, on the other hand, function as aggregates or fillers in the loam, and have no binding force. This means that without any clay, objects that employ earth as a primary material would not hold their shape after drying, which would cause them to collapse. Sand helps to modulate the texture of the mix and is added when clay content is too high in order to thin the paste. Other coarse aggregates, like sand or gravel, can be added to make clayey soils leaner, increasing the compressive strength of the loam—defined as the resistance of a material to break under a mechanical force (Minke 2013:31). Depending on the type of soil, different materials can be added to improve structural tolerance, prevent shrinkage, or fracture, and diminish the vulnerability to moisture (Guerrero and Uviña 2018). These are commonly known as "stabilizers" or "additives", which can be of mineral, plant, or animal origin. In modern construction, cement is usually added as a stabilizer against water, which interferes with the binding force of the clay, increasing its compressive strength (Minke 2013:38). Artificial stabilizers can also be used, such as synthetic resin, paraffins, or synthetic latex. Animal products such as urine, blood, and manure have been used historically in non-industrial contexts to stabilize loam (Cooke 2010; Minke 2013; Rivet and Tomasi 2011). Natural stabilizers—like lime—and animal stabilizers, like manure or whey, can be used in combination as well (Minke

2013:39). Plants or vegetal fibers also function as additives. Chaff, for example, can be added as a modifier to reduce shrinkage and swelling of the clay component (Cooke 2010:13). Straw, another common stabilizer, can counteract the effects of shrinkage and cracking by holding the material together during the process of drying, and provide workability to the mixture by reducing soil plasticity. This prevents the mix from sticking to tools or hands (Cooke 2010:14).

The different ways of improving soils' characteristics by manipulating its additives has multiple purposes. The reduction of shrinkage during the drying process is key, which is a physical reaction of the material that results in wall cracks—compromising the stability of the structure. To prevent this, water content, types of clay minerals present in the soil matrix (expansive or non-expansive), and grain size distribution—factors that directly impact the quality of the construction—can be intentionally manipulated. Compressing soils to increase its density is also key for reducing the porosity of the material and make it more impermeable to water—which can be achieved through manual or mechanical force[16] (Guillaud et al. 1995). These transformations require experience, and a good knowledge of soils, given that a preparation suitable for use in construction will depend on the conditions of local geological landscapes[17].

Soils for building can either be produced by natural causes or artificially: mixing loam with water and additives to make a wet malleable mix. The most direct way to prepare the mixture for building, if it is not naturally available, is by combining wet loam with an instrument

[16] Rammed earth, for instance, is a type of unbaked earthen construction that is formed by compacting moist soils inside a temporary formwork (Walker et al. 2005).
[17] Architect Gernot Minke (2013)—who has worked extensively on the study of sustainable materials for building—notes that moist crumbled earth with low clay content and more sand content can be used immediately to build rammed earth walls. Soils that are too clayey cannot be used as a building material unless they are thinned with sand to lower their plasticity—which is essential for facilitating drying and preventing cracks.

(a hoe, for example) or bare feet. If available, animal power can also be used for this task, but almost invariably some form of mechanical force is required for mixing. If the quality of the soil is adequate, clods of soil can be soaked in water so they can become plastic on their own (Minke 2013:34). The mix can be left to sit for one or more days, which improves the distribution of the materials in the loam (Guerrero and Uviña 2018:2). Once the soil has sufficient moisture and plasticity, it can be molded by hand or feet—or with machines in the case of non-traditional architecture. Additives are integrated into the matrix during the mixing process, which is usually a tradition-based knowledge that also depends on the local availability of resources (McHenry 1989).

Material studies of earthen architecture in archaeological contexts have increased in the last 20 years, as archaeometric techniques have become more widely available (e.g., Gama-Castro et al. 2012; Goodman-Elgar 2008; Nodarou et al. 2008; Pavía and Caro 2008; Spengler et al. 2010). However, in the region of study, despite an important tradition of architectural studies in archaeological context (e.g., Adán 1996; Castro et al. 1993; Gallardo et al. 1995; Urbina et al. 2012), typological approaches have long been the norm. The material approach proposed here is the first systematic attempt to study architecture as a technological practice. A combination of macro and microscopic petrography, XRD, and the analysis of microfossils was conducted to detect potential practices of soil preparation, taking into consideration the mechanical qualities of the material. The premise of this examination is that soils can be manipulated through selection and addition of ingredients to improve its quality as a constructive element, and therefore its transformation entails a series of technological choices that are part of a broader corpus of pedological and architectural knowledge. As ceramic studies have demonstrated, a set of structured practices associated with soil selection to produce everyday objects already existed

when these sites were built. With the purpose of evaluating whether there was an analogous set of practices for building, 16 sediment samples were obtained across four sites in the ravine, including one soil control sample extracted near Ramaditas. The main criteria for sample selection were radiocarbon dates—from ~2500 to 1900 cal. years BP, associated with the Formative period—wall preservation, and type of construction. When possible, samples were taken directly from the wall, based on the function they performed within the building fabric: mud balls (non-modular), mud bricks (modular), or mortar (binding agent). In multiple cases, architectural variations could not be identified due to preservation issues. The samples were also tested for the presence of microfossils, to recognize the potential addition to vegetal material to modulate the mix.

**Soil assemblages**

All samples were examined under magnification to characterize the granulometry of the soils used for construction, and to recognize potential processes of soil selection[18]. These examinations yielded relative percentages of mud[19], sand, and gravel in each sample[20]—which determined their textural classification—and the relative presence of minerals, rock fragments, and /or other potential materials in the matrix. For analytical purposes, each sample was divided into a matrix and a clast portion. The matrix of the sample consisted of particles smaller than 0.125mm (silt + clay), while the clast fraction included grain sizes of sand and gravel (0.125 to 4

[18] All samples were analyzed by geologists Camila Riera and Liz Vilches.
[19] This includes all material composed of clay-and silt-sized particles that are mixed in unknown proportions in unconsolidated sediment (Nichols 2009:21).
[20] The reference used for grain size estimation was the Wentworth scale. Four basic divisions are recognized: 1) clay (<4μm); 2) silt (4μm to 63μm); sand (63μm or 0.063 mm to 2.0mm); 4) gravel/aggregates (>2.0 mm) (Nichols 2009). Percentages were defined through tables of visual estimation.

mm). The matrix/clast proportion, or the arrangement of different grain sizes, is relevant for determining how conglomerates (consolidated gravels) are transported and deposited by geomorphological phenomena (Nichols 2009), serving as material proxies for identifying natural processes of rock formation. A conglomerate that is matrix-supported, in which most of the clasts "float" in the matrix, is common in dense debris flows, like slow-moving mudslides, and steep slopes. A clast-supported conglomerate, where clasts touch each other, is often associated with fast-moving flows, such as rivers and springs. The arrangement of clasts within the conglomerate is also relevant for interpreting depositional processes[21]. Pebbles are moved more easily than cobbles in a flow of water, while boulders require more energy to move than cobbles. In this case, most of the samples are matrix-supported (N=14), strongly indicating that the soils used for construction came from slow-moving, viscous slurry that spread over the catchment area of the alluvial fan.

Another attribute that was employed in the petrographic description was the selection, a measurement of the relative size of the grains. When most grains fall within one category, they are considered well-sorted. A poorly sorted conglomerate, on the other hand, has two or more types of grains, showing, in general, a heterogeneity of sizes. Selection can indicate possible technical choices regarding the type of soils that, macroscopically, seem suitable for

[21] Deposits that are made up of boulders covered by cobbles and then pebbles, can be interpreted as having been formed by flows that were decreasing in velocity (Nichols 2009). It is the case of sample REF-F, which comes from a natural deposit near the edge of the canyon. This sample shows a grain size gradation and a particular orientation of the clasts, typical of alluvial deposits. These are accumulation of detritus at a break in slope on the edge of alluvial plains (in this case, the PDT), formed by debris from flows of water and sediment that come from the higher grounds of a drainage system through a feeder canyon (Nichols 2009). Alluvial formations are part of the local geology, forming deposits from the Pleistocene-Holocene (PlHa), the Late Miocene-Pliocene (Mpa), and active alluvial fans (Ha) along the ravine (Figure X).

construction. But in this case, there was no clear pattern of selection, and samples are well-sorted and poorly sorted almost in the same proportion.


Figure 3. 9. Most samples were poorly sorted and matrix-supported (Sample #2-R).

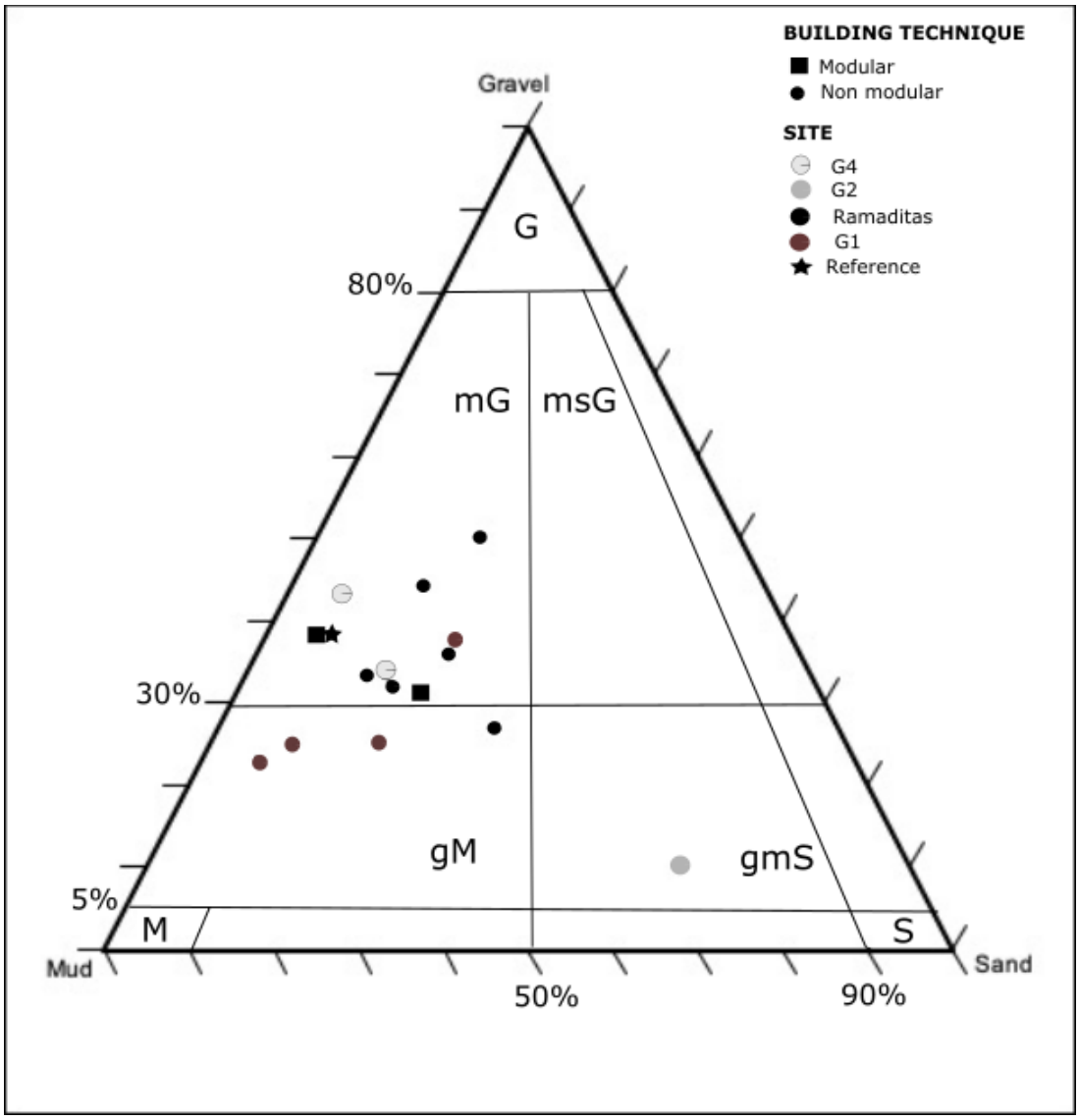



Figure 3. 10. Soil texture for each architectural sample, separated by type of construction technique (modular and non-modular).

Most soil textures, regardless of site provenance, fall within the categories of Gravelly Muds or Muddy Gravels, without significant differences detected in proportion of grain sizes. Most samples show high mud content (silt + clay)—close or above 50%—consistently low levels of sand, and high frequency of gravel. Relatively low portions of sand indicate that these were not lean soils, and that compressive strength was mostly afforded by the high presence of larger

gravel particles and stones. The only exception is sample 11-G2—which presents high sand content and a very low fraction of mud. These similarities demonstrate that it is generally not possible to distinguish building techniques based on granulometry of soils alone (Table 3.2).

Beyond granulometric characteristics, the petrography of four thin sections (samples REF-R, 22-R, 20-R, and 11-G2) yielded no significant differences in terms of the mineral composition of the soils. Soils are a mix of lithic fragments, quartz, and plagioclase, with both natural and architectural soils displaying organic material as part of the matrix, which would indicate that vegetal matter could have been present in the mix, and not intentionally added to it. In sum, based on the granulometric and petrographic characterization of soil samples, it is not possible to conclude that there was an intentional process of soil selection. The microscopic examination of the soils did not reveal evidence that could indicate that these were prepared or manipulated soils.

| Sample | Site/Structure | Building type | Texture (%) | | | Textural classif. | Selection |
|---|---|---|---|---|---|---|---|
| | | | Mud | Sand | Gravel | | |
| 1-R | Ramaditas-C1-Strc 3 | NM | 41 | 23 | 36 | Muddy Gravel (mG) | Moderate to poorly-sorted |
| 2-R | Ramaditas-C1-Strc 3 | NM | 50 | 17 | 33 | Muddy Gravel (mG)/Gravelly Mud (gM) | Poorly-sorted |
| 8-R | Ramaditas-C3-Strc 51 (mortar) | M | 40 | 33 | 27 | Gravelly Mud (gM) | Poorly-sorted |
| 18-R | Ramaditas-C2-Strc 17 | NM | 40 | 16 | 44 | Muddy Gravel (mG) | Moderate to well-sorted |
| 19-R | Ramaditas-C3-Strc 49 | M | 47 | 22 | 31 | Muddy Gravel (mG)/Gravelly Mud (gM) | Well-sorted |
| 20-R | Ramaditas-C2-Strc 29 | NM | 52 | 15 | 33 | Muddy Gravel (mG) | Well-sorted |
| 21-R | Ramaditas-C2-Strc 22 | NM | 30 | 20 | 50 | Muddy Gravel (mG) | Moderately-sorted |
| 22-R | Ramaditas-C3-Strc 51 (mud brick) | M | 55 | 7 | 38 | Muddy Gravel (mG) | Well-sorted |
| REF-R | Ramaditas-Control sample | Soil | 54 | 8 | 38 | Muddy Gravel (mG) | Moderately-sorted |
| 11-G2 | Guatacondo 2-Central | n/o | 27 | 63 | 10 | Gravelly muddy sand (gmS) | Well-sorted |
| 12-G1 | Guatacondo 1-Strc 31 | NM? | 55 | 20 | 25 | Gravelly Mud (gM) | Poorly-sorted |
| 13-G1 | Guatacondo 1-Strc 113 | NM? | 40 | 23 | 37 | Muddy Gravel (mG) | Moderate to well-sorted |
| 14-G1 | Guatacondo 1-Strc 174 | NM | 65 | 10 | 25 | Gravelly Mud (gM) | Moderately-sorted |
| 15-G1 | Guatacondo 1-Strc 42 | NM | 70 | 7 | 23 | Gravelly Mud (gM) | Poorly-sorted |
| 16-G4 | Guatacondo 4-Strc 3 | n/o | 50 | 18 | 32 | Muddy Gravel (mG) | Poorly-sorted |
| 17-G4 | Guatacondo 4-Central | n/o | 50 | 7 | 43 | Muddy Gravel (mG) | Poorly-sorted |

Table 3. 2. Soil textures obtained from 16 samples across four sites in the valley.

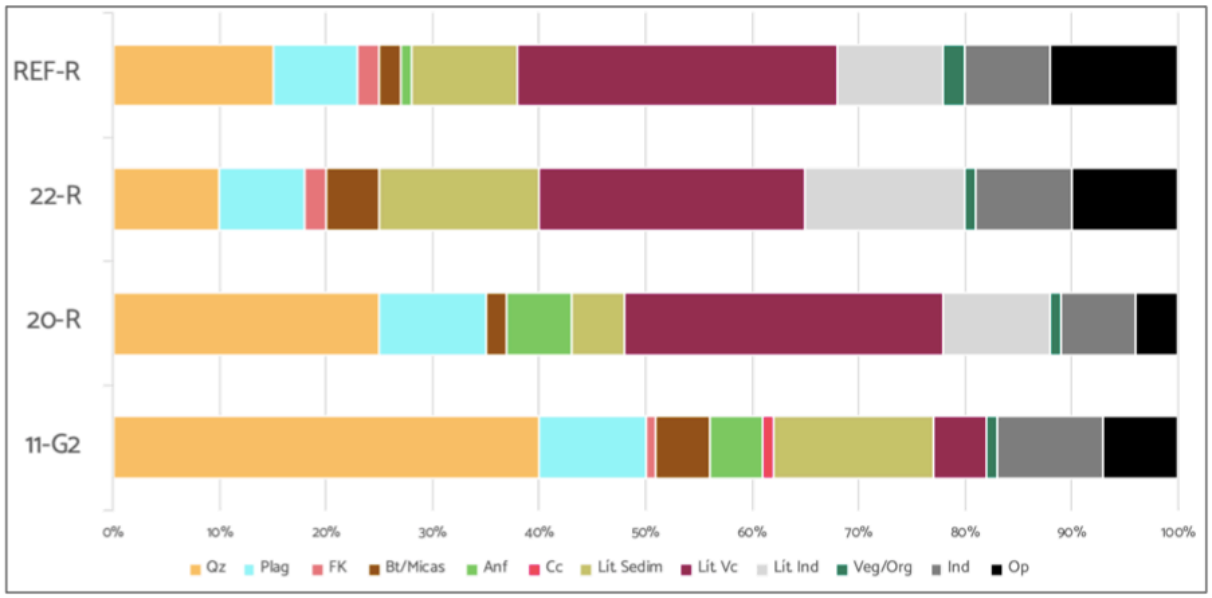



Figure 3. 11. Graph showing the cumulative compositional abundance (%) of the thin sections analyzed.

**Plant assemblages**

Additionally, all samples were tested for the presence of microfossils to identify plant assemblages within the building mixture. Because vegetable fibers facilitate the adherence of soil particles and modulate the effects of shrinkage that results from changes in temperature and humidity shrinkage that results from changes in temperature and humidity, botanical inclusions have a stabilizing function. A homogeneous plant assemblage might indicate a selection and intentional addition of certain vegetal stabilizers, while a heterogeneous assemblage may be indicative of the opposite operation. One of the main limitations of this analysis was botanical reference collections for Guatacondo are not available, so identifications were based on other reference collections of the Atacama Desert, as well as other published materials (Esau 1985; Pearsall and Piperno 1993; Pearsall 2000; Piperno 2006; Babot 2007; Korstanje and Babot 2007).

Both wild and domesticated plant remains were identified in the total sample[22]. A total of 1896 vegetal micro-fossils were counted, which included, in order of abundance, the following types: micro-carbons (77.42%), pollen (17.83%), phytoliths (3.85%), fragments of plant tissues (0.58%), and starch grains (0.32%) (Table A.2). The botanical remains that appear in significant frequencies in every sample are micro-charcoals, indicating the presence of combusted material in the soils (Figure X B). Whether this was an intentional addition or not is unclear, given that the only sample obtained from a natural deposit yielded similar frequencies. Unfortunately, taphonomic transformations did not allow the identification of diagnostic traits that could aid in the determination of plant species. Pollen grains are the second most abundant remain, although only one case (18-R C) could be assigned with certainty to the flower of *Typha* spp., a genus of aquatic or semi-aquatic, rhizomatous, herbaceous perennial plants. Phytoliths, the mineral skeleton of plants, are the third most abundant kind vegetal assemblage in the sample. Because these are inorganic remains of organic elements, they are resistant to decay and preserve when other parts of the plant decompose (Piperno 2006). Most samples contain Poaceae-like phytoliths, and only one case (REF-R) could be identified as a leaf of *Cortaderia speciosa* (Figure 3.13). The totality of macrobotanical remains found in the samples belong to the Poaceae grass family. The presence of plant tissues was very modest, although a *Prosopis* spp. epicarp (skin) was identified in a sample from Ramaditas (18-R B).

[22] All samples were analyzed by archaeobotanist Ximena Albornoz in February of 2019.

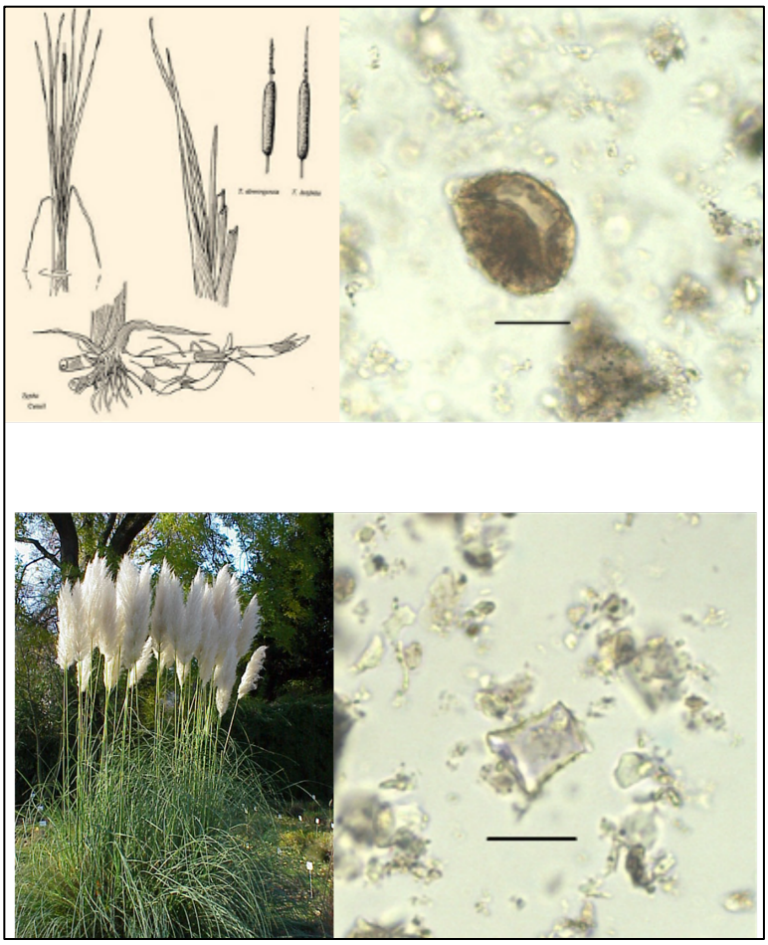


Figure 3. 12. Microfossils in sample 4 (Ramaditas): Pollen cf. *Typha* sp. 400x scale 20µ (above), or cattail; Phytolith similar to *Cortaderia speciosa*. 400x scale 20µ (below) (Reference photographs licensed under Creative Commons).

In sum, this microscopy of the construction material indicates that, unlike ceramic manufacturing, in architecture there was no analogous process of soil preparation. The examination of these material micro-assemblages made up of plants, rocks and water reveals that this is the product of natural processes that point to larger-scale cycles, which determine the availability of fresh mud.

## Assembling buildings, creating tangible connections

By August of 1969, the excavations at G1 were well underway. 26 structures were completely excavated, four of which had been dug previously by Dr. Mostny. They displayed "considerable variation in their details, but remarkable uniformity in their overall pattern and contents" (Meighan 1980:102). According to Meighan, the large oval-shaped structure of the center was built with chunks of mud, and the only structure that required communal effort: "the surrounding wall contains about 67 $m^3$ of clay chunks and appears to have been built all at once; a single family could build such a wall in a month or two, but a community labor force of the size available in Guatacondo could have put it up in a day" (1980:105). This was the only reference to the construction process, a clue for understanding how labor—the social organization of material creation—was assembled and mobilized.

This chapter was designed to search for tangible connections between buildings and builders, following technical operations through a material study of architectural elements and forms. In contrast with conventional typological approaches, I outlined a method designed to contest the notion of buildings as bounded objects, treating them instead as a composite of material elements and performances that, combined, constituted a historically situated practice. In this sense, my aim was to present an approach to architecture as a material practice rather than as a social text, highlighting the particular forms of sociality that this technology promoted. The examination of operational sequences—made up of those reiterative gestures and coordinated actions materialized on mud walls—illustrates the differential management of building rhythms,

materials, and work of those who build together. The homogeneity observed at a spatial scale, a semi-subterranean structure with curved walls arranged in a cellular pattern, contrast with the heterogeneous ways in which walls were assembled. This material fact sheds light on the social nature of building, a practice that always required cooperation[23] or the collaboration of multiple hands working simultaneously. While my analysis centered on the examination of two operations, it is possible to assume that these cooperative efforts extended beyond the assembly of walls and across the operative sequences of digging soils, gathering wood, setting up wooden poles, and thatching houses[24].

[23] I am thinking specifically through Marx's understanding of the social as "the *co-operation* of several individuals, no matter under what conditions, in what manner and to what end" (Marx 1978[1932]:157. Emphasis added).

[24] Pauketat and Alt (2005:229) suggest that practices that involved collective labor and coordinated performances created "communal sensibilities", or shared dispositions (memories, bodily movements, sensuous experiences). Referencing the practice of post-setting in Cahokia, they argue that "when put in motion by human bodies, repetitious physical constructions—particularly as they involved the simultaneously material, spatial, and corporeal dimensionality of posts—likely syncretized identities by blurring the boundaries between bodies, persons, things, and places."

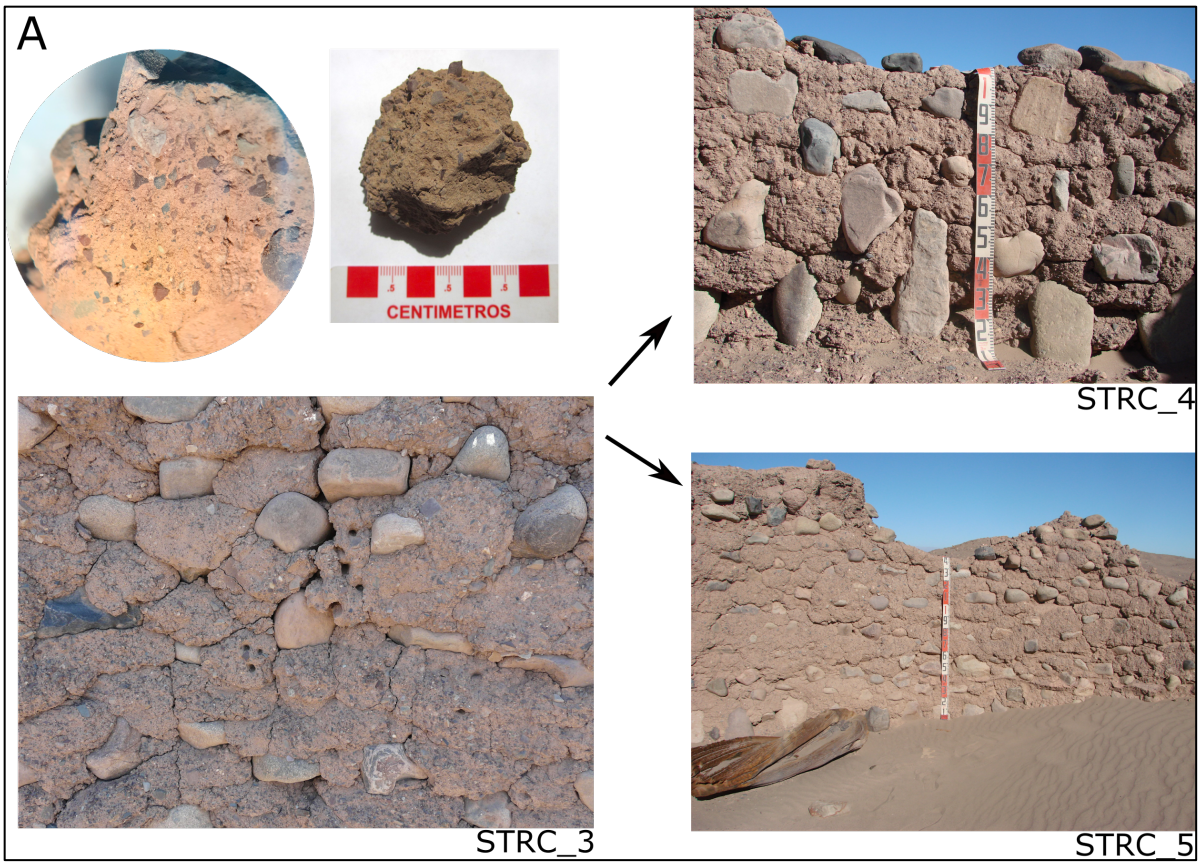
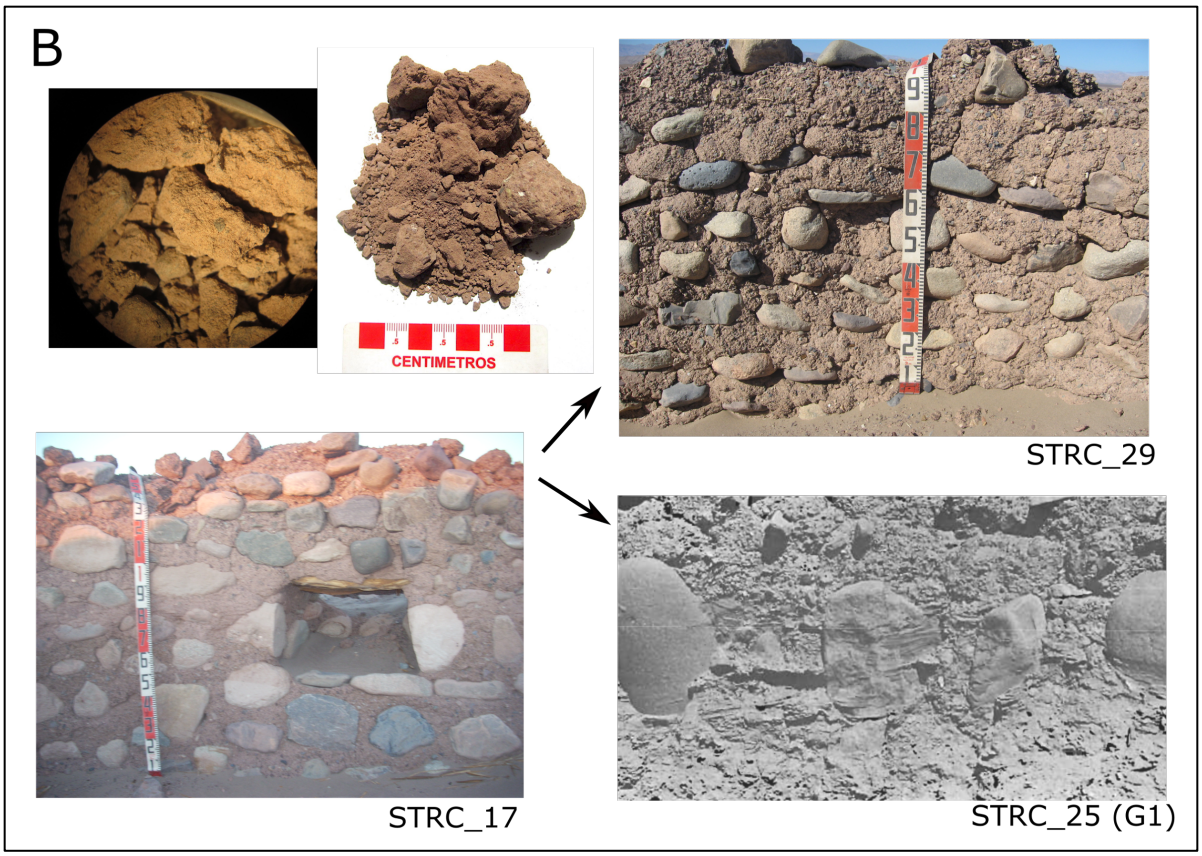



Figure 3. 13. Microscopic and macroscopic views of architectural variations A and B.

Figure 3. 14, continued.


B
CENTIMETROS
STRC_29
STRC_17
STRC_25 (G1)

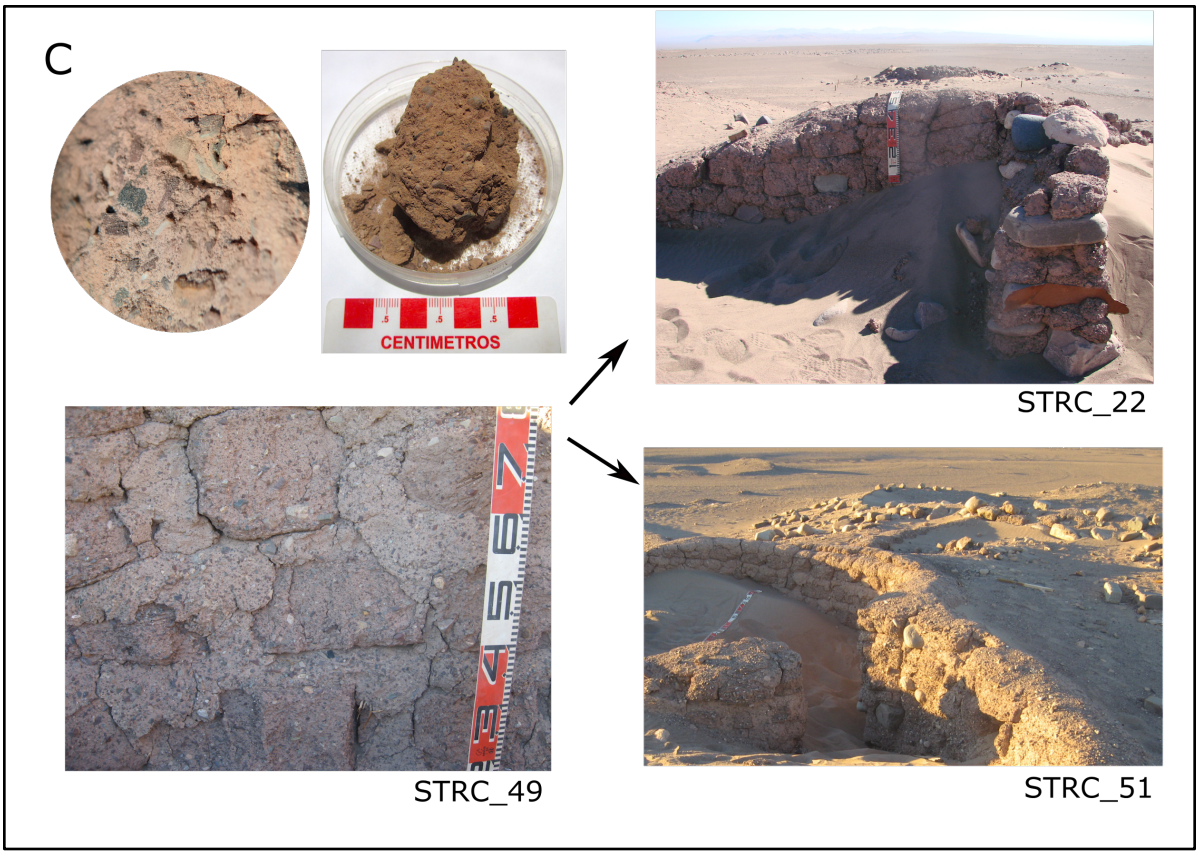



Figure 3. 14. Microscopic and macroscopic views of architectural variation C.

Considering the seasonal hydrological pattern of the valley, architectural variations A and B, which required wet soils, must have been restricted to the same seasonal logic—with possibly multiple sources of mud along the ravine. Variation C, however, made use of consolidated modules that were dried in their natural matrix before they were used. While there are no clear material indications that the modules were elaborated with molds—they are highly irregular in size—the drying period is what allowed them to maintain their shapes. Given the absence of clear chronological differences among the variations, it is possible that variation C was employed when wet soils were no longer available—later in the building season. However, this variation seems to have been marginally employed, strongly suggesting that building required the availability of wet soils.

| | | | |
|---|---|---|---|
| **Site** | Macro-scale | Uniformity | Clustered, circular floorplans, aggregation of individual units |
| **Building** | Mezzo-scale | Variability | Modules, mud balls, stones, mortar, arranged in different variations |
| **Material** | Micro-scale | Uniformity | Similar soil and plant assemblages in the mixture |

Table 3. 3. Patterns of uniformity and difference across scales of analysis.

The case study presented in this chapter suggests that architectural choices—whether to use stones or adobes, for instance—involved distinctive temporal rhythms and synchronized actions, revealing the immediacy of these building acts. Working with fresh mud demanded the mobilization of multiple builders because the material itself required a speedy assembly. Returning to my comparison with pottery, the architectural emerges as a field of knowledge and practice that is organized, choreographed, transmitted, and/or practiced in collective ways; it is both broadly circulated and intimately familiar. I interpret the relative homogeneity of pastes as the absence of a standardized recipe for architectural production, suggesting that unlike pottery, technical choices operated at the scale of wall assembly rather than soil selection. Because at a compositional scale the soils are quite like natural ones, it is highly likely that builders sought material that was readily available to make a variety of building elements: mud bricks, mud balls, and mortar.

This process of "quick assembly" was partially determined by the intrinsic mechanics of soils, or the amount of time the material stayed in a plastic state. If acts of building together depended, at least partially, on the availability of fresh mud, then architecture itself can be

regarded as a seasonal practice that worked in tandem with the broader rhythms of agricultural production and hydrological cycles. And if building was more or less an "opportunistic" practice, periodically bringing people together, then the lack of standardization of constructive forms indicates that there were multiple ways of assembling a wall. This suggests an open and widely shared domain of technical skills, or adaptable technical solutions that did not strictly follow fixed sequences. If pottery in the region has been defined as an orthodox technology (Uribe and Vidal 2015), then architecture during the same period seems to have been quite heterodoxical. Architecture appears, then, as a fluid and creative field of material practice.

The "seasonality of building" that I propose effectively decouples building from permanence by tracking the transformation of mud into a social material, instead of assuming that permanent architecture works as a proxy for sedentism and agriculturalization. The collective engagement in technological projects activated networks of participation that periodically brought people together, suggesting that the forms of sociality afforded by these building practices privileged proximity and continual commitment, assembling a social group that had to coordinate multiple hands to build the infrastructure of communal living.

## CHAPTER 4. Transformative Architectures

In what is by now a classic ethnography of the social organization of the Andean world, Denise Arnold (1998) describes the special language used in libations (*ch'alla*) during the construction of the house, in the aymara-speaking *Qaqachaka* territory of the Bolivian highlands, between Oruro and Potosí. This activity, usually carried out in the dry season, between the last harvest and the following sow[1], occurs in a ritualized context that physically recreates the order of Andean society from the ground up, a good example of how these communities "[put] the past to work for the purposes of the present" (Abercrombie 1998:129). The verbal content of the *ch'allas*, or the ritual discourse, refers to material elements (gold, silver, mud, rocks), cosmological figures (the sun and the moon), animals, genders, and kin in a specific order, following the vertical structure of the *uta* (Aymara for "house"), from the foundations to the roof[2]. These invocations, uttered intermittently while drinking, can be sung, or recited during the celebratory instances that take place at the end of the wall construction, and after thatching has been completed[3]. Arnold (1998) mentions that women often sing songs about the origins of their animals and gods, a practice of naming that links places and histories through material connections. As the "pathways of memory" (Abercrombie 1998) are deployed in the language of

[1] Arnold (1998) notes that in Bolivian highlands, the walls are commonly finished by October, and the thatching of the house is usually celebrated around All Saint's Day, the first days of November.

[2] These are the "pathways of memory" that Abercrombie alludes to in his ethnography of K'ulta, near lake Poopó in the Bolivian Altiplano (Abercrombie 1998). The stories that are embedded in the landscape, the tales that are told in *borracheras,* the drinking that almost always accompanies collective endeavors, are ways of recollecting and commemorating the past in contingent contexts whose narratives are not fixed, but always get contested as they are retold.

[3] "Los Qaqas recuerdan los varios componentes de sus casas en las fiestas realizadas en ambas ocasiones, primeramente cuando se han levantado las paredes, en la fiesta de *taqan pirqa*, 'construir la pared' y luego en la fiesta colectiva principal que ocurre al final del proceso de construcción cuando se pone arriba el techo, *utachäwi*" (Arnold 1998:36).

the *ch'allas,* men and women—the first situated at the right side of the house (*kupi*), which is associated with the masculine, the latter on the left side (*ch'iqa*), linked to the feminine—start by making reference to the virgin Earth ("Tierra Virgen", *Tila wirjina* in Aymara) as the source of all the construction materials: from the adobes that make up the walls, to the straw that covers the roof (Arnold 1998:49). Gender distinctions reflect the matrilineal and patrilineal descent lines that are built into the structure of the house. Similarly, the four corners of the house (*iskina*) are marked and connected to the ancestral lineages that reside in that territory. Foundational stones are often buried alongside offerings that include raw things—such as animal fetuses, fat, or vegetal resines—and are called "Inka" in the language of the *ch'alla*, referencing the power of the "Father Inka" (Arnold 1998:52) to move heavy boulders. But it is only through a good mortar that the stones are kept upright and solidly bounded: Arnold notes that the mud used for manufacturing adobes is called *waru*[4], while the soft and liquid mortar used for bounding is called *kula*[5]. The water that is used for mixing is called *awara* in Aymara, derived from the Spanish "aguada", which designates a source of water, or spring, but also the moist soil that is left after it rains, or blood that comes from menstruating (Arnold 1998:53). This distinction speaks to the intimate connection between material textures, sources, and buildings—a way of approaching the material world that is attuned to qualities instead of quantities.

The walls are then elevated to the gable, the portion between intersecting roof pitches, called *mujinta* or *mujinita*, derived from the Aymara *muji,* which designates the corner of a weaved blanket. The metaphor of the house as a loom or as a place that is weaved through intersecting lines of kinship, further references the genealogy of the group involved in the

[4] From "barro", Spanish for "mud" (Arnold 1998:53).
[5] From the Spanish "cola" (Arnold 1998:53)

construction of the new house. The roof is built with wooden beams, and the *ch'allas* mention the sources of the materials used for thatching[6]: "Para el monte" ("For the hill", *muntitaki* in Aymara, which combines *munti*, or "hill", and *taki*, which means "for"), the source of the timber used for the upper section of the *uta* (Arnold 1998:57). The *uywiris* (protective entities, in this case, hills) are seen as the source of materials for construction, delivering them as creatures, or *guaguas.* Beams are used to build a timber roof truss that is secured with ropes, sometimes called *jaraphi* in Aymara, the word for "ribs", alluding to a live, breathing structure. The triangular shape of the roof mimics the shape of a hill, the pitch following the steepness of the slopes, and the straw that covers it is like the hair that covers a head. The house thus follows a vertical order, a structure whose materiality is animated and historicized through these building acts, each of which makes the participants active builders of their own collective history, and the material, a live agent in the building performance (Figure X). For Arnold, the gradually deployed exegesis of the *ch'allas*, the vitality of the images invoked, and the rhythmic wordplay is a manifestation of an "Andean order of things", in which building figures not as a technological practice, but rather as an "art of memory" (Arnold 1998:36, translation my own).

[6] In the quechua speaking town of Raqchi (near Cusco, Perú), Sillar (2013:33) mentions that house-roofing is referred to as *wasichakuy*, "to make a house", and the same word refers to marriage. House-roofing is usually accomplished by a large work party "headed by the combined forces of the couple's immediate kin and concludes with a festival meal".

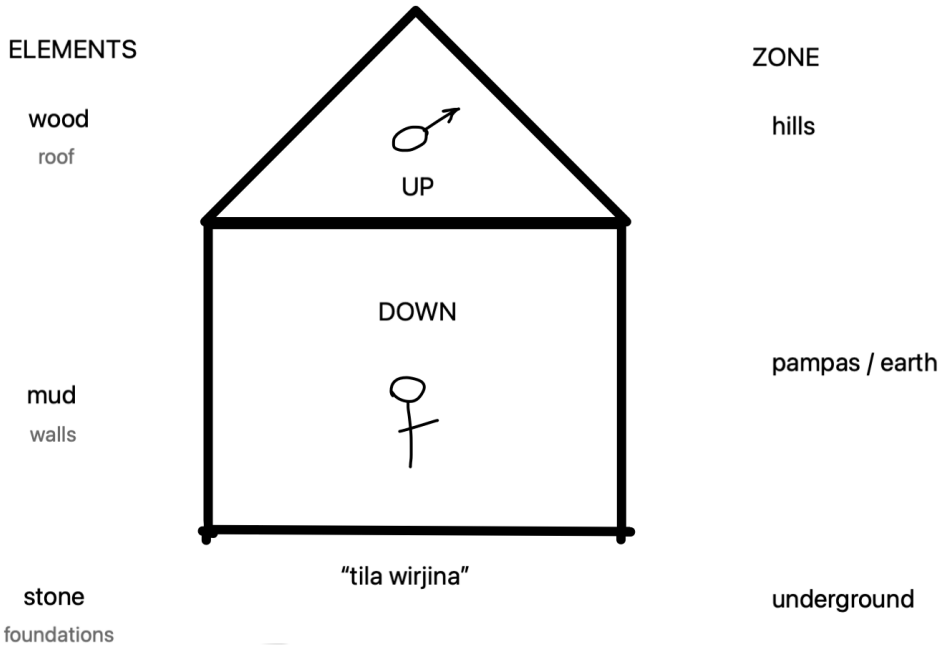



Figure 4. 1. Gender, material, and ecological relations materialized in the structure of the uta (Based on Arnold 1998:62).

The people summoned to help are neighbors, kin, and *compadres*, part of a long tradition of collaboration among members of the *ayllu* referred to as *ayni*[7], a reciprocal exchange of labor. Sillar (2013:32) defines *ayni* as an "exchange that begins by a member of one household (A) petitioning someone from another household (B) to come and work for them (offering them food and drink while they do so); this is repaid when B requests A to do comparable work, such as agricultural activities [...] As the couple requests and repays successive *ayni*, they are brought into a widening circle of reciprocity"[8]. Isbell (1997 cited in Sillar 2013:29) uses the words of one

[7] In his "Vocabulario de la Lengua Aymara", Ludovico Bertonio defines *ayni* as "el obligado a trabajar por otro que trabajó por él", which can be translated as "he who is obligated to work for someone who worked for him" (Bertonio 1612:29. https://dl.wdl.org/13776/service/13776.pdf).
[8] Sillar (2013:32) describes house construction in Raqchi as follows: "Most houses in Raqchi consist of at least a small kitchen and a larger room that is used both for storage and for all the

of her informants to describe the people who participate in these collaborative projects as 'those who love me'". Others have contended that, contrary to an ideal of community that emphasizes equality, solidarity, self-sufficiency, *ayni* constitutes a principle that regulates social difference, sometimes by mitigating it, sometimes by amplifying it (Paerregaard 2017; Urton 1988). In fact, this cooperative effort can often become an arena of competition, with groups headed by different sides of the family attempting to prepare more mud bricks, for example (Sillar 2013:32). Urton (1988) has similarly argued that, in the Quechua-speaking town of Pacariqtambo (Perú), the communal maintenance of the walls of the local church operates as a non-verbal social dialogue among the *ayllus*, a political exchange that is resolved in the acts of caring for a section (*chhiuta* in Quechua) of a public building. Because each section of the wall is designated to an *ayllu*, the active participation and investment in communal projects can actually be read in how well-kept each of them is (Figure 4.2). When one of the *ayllus* repairs their section of a wall by rethatching, replastering, rebuilding, or painting, it prompts other *ayllus* to respond, lest they lose their political standing. One section of the church wall that stood in disrepair, partially collapsed, was unsurprising for members of other *ayllus* who characterized that group as very unorganized and relatively poor (Urton 1988:237). The active investment in the collective translates into an ethos of repairing as caring and building as a political act.

family to sleep in. As the family and house develop further rooms for storage, workshops, subsidiary bedrooms, or animal pens may be added. An essential element is a wall surrounding the house compound that separates it from other households and demarcates a patio for daytime activities".

Figure 4. 2. Different sections of the eastern wall of the church of Pacariqtambo (From Urton 1988:238).

Also in Quechua-speaking territories, Peter Gose (1991) examined the practice of house-rethatching as part of the annual agricultural cycle. In the town of Huaquirca, the replacement of the roof coincides with the shift from dry season to growing season, accompanied by two corresponding systems of cooperation that organize labor and local politics. This seasonal variation in social relations amounts to seasonally opposed moralities, switching from an emphasis on private appropriation by individual households during harvest season, to extensive inter household cooperation during the growing season. The phase of the year dedicated to private appropriation begins with *Carnaval* in February, during the climax of the rainy season once the crops are starting to reach maturity. Gose (1991:44) notes that up until this point, "the crops have been the focus of an intense effort of collective production involving the generalized exchange of labor, corn beer, and food among households in large work parties based on the

symmetric and egalitarian relation of production called *ayni*."[9] But during the harvest season, after maize is picked and potatoes are dug out of the ground, they are loaded and taken to be stored in their owner's house. Because it is organized according to patterns of communal land tenure divided into maize-growing and potato-growing sectors—where each household is responsible for an extension of cultivated land—harvesting takes place on a very tight schedule. As a result, each household tends to work by itself, fearing they will fall behind the rest or lose crops to theft or destruction by animals. Appropriating the fruits of cooperation privately and working as a property-owner unit, the logic of *ayni* does not work during harvest "simply because there is not enough time allotted to each episode of harvesting to permit the functioning of the extensive delayed reciprocity networks that prevail through the growing season" (Gose 1991:47). However, Gose notes that there is still small cooperation during harvest, which involves those who have little or no land in a particular sector. Usually, these individuals would offer their help unsolicited, receiving in return a carrying-cloth or *lliqlla* full of produce at the end of the workday. This form of cooperation has a different name in Huaquirca, *mink'a*, which denotes exchanges of work for food and drink (Gose 1991:47). The dominance of *mink'a* relations lasts until August-mid September, when the house-rethatching takes place, bringing together large work parties for the first time since the end of the rainy season in March—anticipating the return of a new growing cycle. Interestingly, the author foregrounds that this shift in relations of cooperation corresponds to the seasonal movement of activities from house to fields.

[9] For Gose (1991:44), the ethos of *ayni* is heavily imbued with the morality of *compadrazgo*.

## Following the material

Historical limitations notwithstanding, the construction of the *uta* provides an ontological orientation that highlights the importance of building as a social performance, while reminding us that technical gestures are firmly entrenched in a much wider universe of history and meaning. The performative aspects of building are not merely redundant, mechanical actions, but powerful carriers of social messages that can only be conveyed in the collaborative act of building together, part of the broader network of material-semiotic practices. The recurrence of these performances is what sustains kinship, where cooperation becomes a form of belonging; through it, people witness and participate in the materialization of place. These ethnographic accounts present us with a fully socialized nature, firmly entrenched in a cyclical and mythical conception of time indissoluble from space and the agential capacities of non-human entities—the earth, hills, rocks, animals, water—whose fortunes are entwined with the lives of humans (Allen 2015; Castro 2002; García 2020; Flores Ochoa 1977; Rivière 1994; Tomasi 2013).

The multi-scalar approach developed in this dissertation addresses the material, social, and ecological relations of a pre-Hispanic landscape. Moving between the elemental composition of building materials and the articulation of sites in the landscape, these analytical scales open up views of face-to-face interactions, like building a wall, and intergenerational histories of occupation. “The act of building a new home [...] has the complementary effect of binding the family into the social networks of the community”, notes Sillar (2013:36) in his study of building projects in Raqchi, in the Peruvian Andes. The coordination of building acts described in this dissertation amounts to a labor process where “work parties” participated synchronically, intimately, and in close proximity. In light of the evidence presented, where environmental cycles define the availability of fresh mud, it is not hard to image how these building acts were

imbricated in seasonal rhythms that entangled the material with the ecological. By exploring what "agricultural villages" are made of, this project followed trajectories and histories of the material outside the bounds of old towns, to trace material connections and demonstrate the irreducibility of the technological to the instrumental. The panoramic of the landscape that emerges once we leave the space of the village is complex and dynamic, revealing that spaces and temporalities overlap, making their categorization a difficult epistemological task.

It is because of what both the archaeological and ethnographic records offer us that we can contest the universality of the Neolithic/Formative paradigm. The house is a story of the collective told once, and never again repeated in the same way, making the architectural project itself non-reproducible, despite what we may see as a highly regimented order of things. The cyclical rhythm of the landscape demands an array of material adjustments that have corresponding social arrangements that *work with an* ecology, not by dominating it, but by having a wide array of technological choices that are able to secure and sustain collective survival. Having multiple tillage systems is only one example of the form of adaptation that I envision, one that is not premised on a relation of control of Culture on Nature.

The collective projects carried out in Guatacondo are an example of what Anna Tsing (2012) calls "non-scalability". The scalability that opposes this principle is about design, its premise is making things reproducible no matter the context. From pixels, to plantations, to factories, scalable projects are all about banishing diversity, stripping things from their relations, both material and historical. Isolates without ties and transplanted across the ocean, the enslaved worker and the sugar cane, to name Tsing's examples, were the result of many failed experiments of what was originally a political impetus: to obtain sugar not controlled by Muslims. And indeed, the precedents of the plantation form are found not in Caribbean but in the

Atlantic islands, the Madeiras, Azores, and the Canary (Mintz 1985). The project of science, like capitalism and modernity, is all about scalability and, as discussed in Chapter 1, the best example is materialized in the implementation of "The System of Nature", which classifies things in the world stripped away from any meaningful ecological and historical relation. The "non scalable", on the other hand, requires attention to historical contingency, attending to the work of experimentation and failure, what Tsing (2012:510) calls "friction". Like the act of house rethatching described by Gose (1991), the quality of the non-scalable is that it cannot be reproduced without fundamentally changing the nature of the project. In and of itself, rethatching in Huaquirca seems like a maintenance response to a seasonal change (from dry to rainy). But in the context of the annual agricultural cycle (which cannot be separated from the ritual cycle), a building act like thatching exposes its historical embeddedness. We can think of the relationships created and recreated through building acts as transformative because one is never sure about the outcome. Bringing together the entanglement of multiple elements, these collective projects—much like agricultural cooperation—are arenas that organize labor, and in so doing, they resolve, express, or negotiate political relations as well. The labor process is materialized through the technological, which risks becoming evacuated from the political if it is perceived merely as an instrument of control. Like Haraway's cyborg, architecture-as-technology is enmeshed in networks of human practices that recursively produce and reproduce the social. Acknowledging the human-architecture hybrid means abandoning notions of simple causality and linearity in favor of dynamic timescales that reject collapsing space/time into a discrete historical unit.

Following these interventions, this project was able to approach architecture in four interrelated ways: 1) as three-dimensional cultural interfaces that result from both a process of physical construction and from a process of social creation; 2) as collective undertakings that are

never fully finished, but always in the process of coming into being and thus open to new interventions by both human and nonhuman flows and agents; 3) as agentive structures, considering that buildings as material entities are a source of actions that have concrete effects that extend through time and space; 4) as figures of technological projects that are situated, historically contingent, and thoroughly part of the social fabric.

## EPILOGUE: Speculative visions for a brighter future

Returning to Le Guin, what kind of history can we imagine if we tell stories with mud? Through this work, I have argued that it is insufficient to understand the village as a historical event or a type of settlement that affords a kind of adaptative advantage over other patterns of settlement. Drawing on Le Guin's feminist standpoint, I approached the village as a project rather than a finalized object, claiming that through the *process* of building we can mobilize a different understanding of technological relations. And while telling stories with mud are impartial histories that do not coalesce around a master, coherent narrative, this is one way to make positionality explicit, pushing against the primacy of the Neolithic/Formative paradigm.

What is *trans*formative about this technology is that it is a materiality always open for new interventions. Like the seasonality of mud, the seasonality of building affords possibilities for new social projects every new season. But mud decays and disintegrates, its own material qualities make it vulnerable to wind erosion and slides, demanding recurrent acts of care and repair. Like Le Guin's bag, these were projects that held the social together. The work of architecture shows us insistently that this is labor that cannot be executed without collaboration, entangling multiple building hands. This choreograph of movements required deep ecological knowledge, because mud was only available seasonally, and presumably certain sources were more adequate than others. This reveals the extent to which the relationship with this landscape was premised on seasonal rhythms that simply did not allow a more permanent occupation. The success of these architectural project depended on people's ability to work *with* the ecological, and not against it. As archaeologists we remained well positioned to create stories of the material that manifest different temporalities, spatialities, naturecultures, and possible collective futures.

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## APPENDIX: TABLES AND AERIAL PHOTOGRAPHS

Table A. 1. Contrasting definitions of the "Formative" in archaeological literature of northern Chile through the 20th century.

| Author | Date | Label | Definition | Archaeological examples |
|---|---|---|---|---|
| Uhle | 1922 | Contemporaneous with Chavin or Period III | "The Pisagua fishermen of period III seem to have been a branch of the Atacameños, according to their greater progress in culture, the use of snuff trays, common in later periods among the Atacameños of the South, and the relationships that already in their time seem to have existed between one and the other, because one of the baskets of Pisagua resembles the identity of another found in Calama." (71) | Sites: Pisagua, Punta Pichalo |
| Bird | 1946 | Agricultural period | "In the succeeding period (Arica I and II) coiled basketry, pottery, weaving, and agriculture appear simultaneously. Grave finds had suggested an early agricultural *stage* with coiled basketry and weaving but without pottery, paralleling the Basket Maker culture of the Southwestern United States; but data from the middens failed to support this sequence" (589-590) | "Chincha-Atacameño" pottery |
| Dauelsberg | 1972 | "Agro-alfarero" | "The *pre Agro-alfarero* does not end abruptly but experiments a *slow adaptation* to an economy supported by crop production, animal husbandry, the use of pottery, the development of textiles and metallurgy, blending with the earlier stages of the *Agro-alfarero*." (171) | "Alto Ramírez Complex" (turban-wearers, no pottery use, but with cultigens); "Faldas del Morro Complex" (cultigens and pottery); "Conanoxa Complex" |
| Núñez, L. | 1974 | "Etapa Formativa" | "The Formative stage meant a considerable *advancement* for small communities of farmers, until agriculture became the basic productive activity for the group. The *increase* in production (irrigation) is its distinctive trait; it emphasizes the importance of advanced communal labor and population growth." (39) | Sites: Alto Ramírez, El Laucho, Quiani, Camarones, Tr 40, Punta Pichalo, Guatacondo, Caleta Huelén 10, Caleta Huelén 20, among others. |
| Mostny | 1981 | "Período Agroalfarero" | "This period is a *world phenomenon*. In the Old World it is referred to as the 'Neolithic'; it usually is discussed as a 'neolithic revolution' given the significant impact the invention of agriculture, animal domestication, and the creation of other industries such as pottery and textiles, among others, had in the development of cultures." (73) | "Faldas del Morro Complex" |

Table A. 1. Contrasting definitions of the "Formative" in archaeological literature of northern Chile, continued

| | | | | |
|---|---|---|---|---|
| Muñoz | 1989 | "Período Formativo" | "The emergence of this n*ew form of economy*, which in some regions appears associated with animal husbandry, meant a larger organization of people and the increase of *specialization* [...] From this moment, man has a new conception regarding *food procurement*: he goes from a predatory economy to one where he is a producer, a fact that will be transcendental for his later development." (107) | "Azapa-Alto Ramírez Complex" "Loa Tumuli Complex" "Vega-Alta Complex" |
| Rivera | 1991 | Andean tradition | "After about 3000 BP, a new tradition, with traits typical of the circum Titicaca area, arose in the coastal valleys—the Altiplanic or Andean tradition, which persisted through the Intermediate and Late period up to recent times. The Altiplanic tradition is associated with the first ceramics and woolen textiles; pottery has been reported as early as 2990 BP from Pichalo, and 3060 BP from Camarones-15, associated with polychrome woollen textiles." (10) | "Alto Ramírez phase" (1000 BC-AD 500) |
| Núñez | 1991 | "Formativo Antiguo" | "First groups with pastoralism and village lives. *Food producers* and *specialized* gatherers with initial settlements and the beginning of complex manufactures (textiles, ceramics, metals) [...] And surplus." (XX) | "Etapa Toconao" (500 a.C.-100 d.C.). "Etapa Séquitor" (100-400 d.C) |
| Agüero & Uribe | 2011 | "Sociedades formativas" | "It was not agricultural production or caravan traffic that played the central role in the Atacameño complexity that arises during the Formative, but rather the *ancient archaic dynamics with local resources* of streams and oases". (76) | "Fase temprana"; "Fase Media" (350 BC-100 AD); "Fase Tardía" (100 BC-500 AD) |
| Uribe & Adán | 2012 | "Formativo" | "A broad coast-valley cultural system takes shape, rooted in the ancestral occupation of the territory between the coast and the Pampa del Tamarugal, which develops as socially heterogeneous." (30) | Sites: Ramaditas, Guatacondo, Caserones. |
| Muñoz | 2016 | "Período Formativo" | "We have associated the beginnings of agricultural activity, and therefore the beginning of social complexity in the valleys of Arica, to the Formative Period, a process that is placed chronologically between 1000 BC and 200 AD." (XX). | "fase Faldas del Morro/Azapa"; "fase Alto Ramírez" |
| Uribe et al. | 2020 | Formative period | "This process was part of a *long history of rationalization of the desert*, and the l*ived experience* of the Formative communities that occupied that *landscape*. Therefore, we propose that this human intervention in Pampa del Tamarugal can be understood not only as an ecological and economic change, but also a cosmological one." (82) | Guatacondo and Tarapacá valleys |

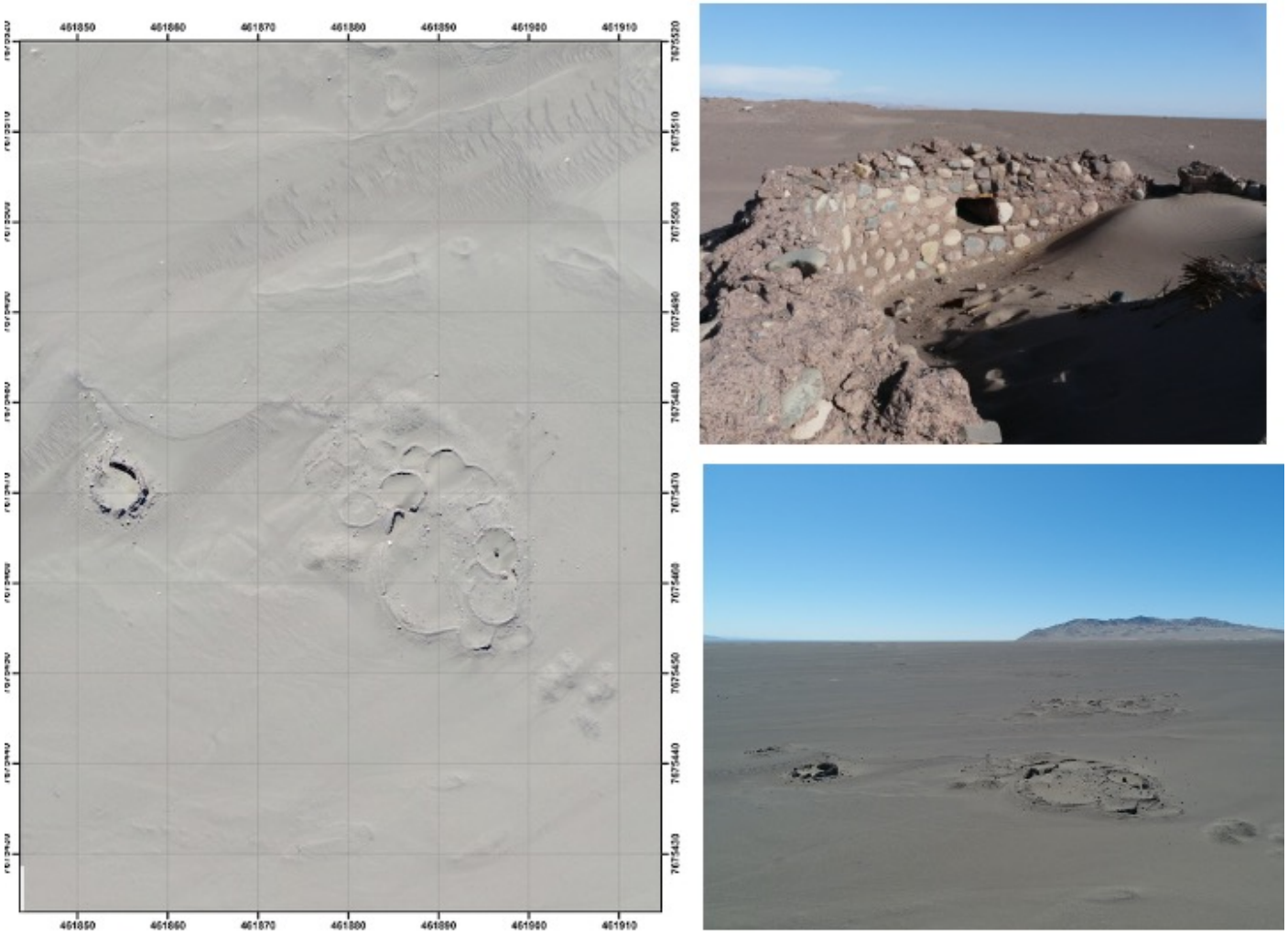
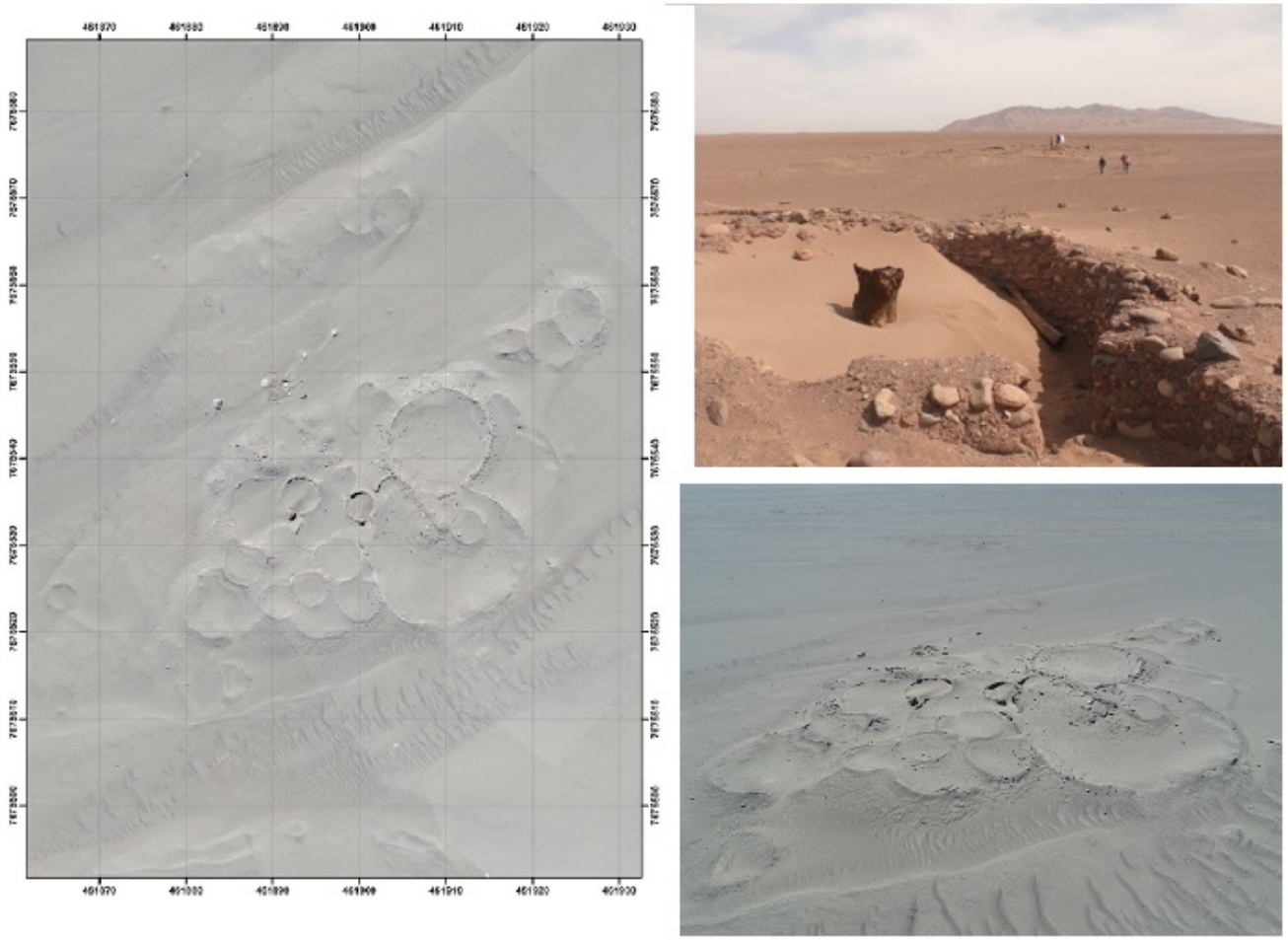


Figure A. 1. Photogrammetry and aerial views of Ramaditas, Compounds II and III. Elaborated by the author using a drone (DJI Phantom 4 Pro).

Figure A.1. Photogrammetry and aerial views of Ramaditas, Compound III, continued.



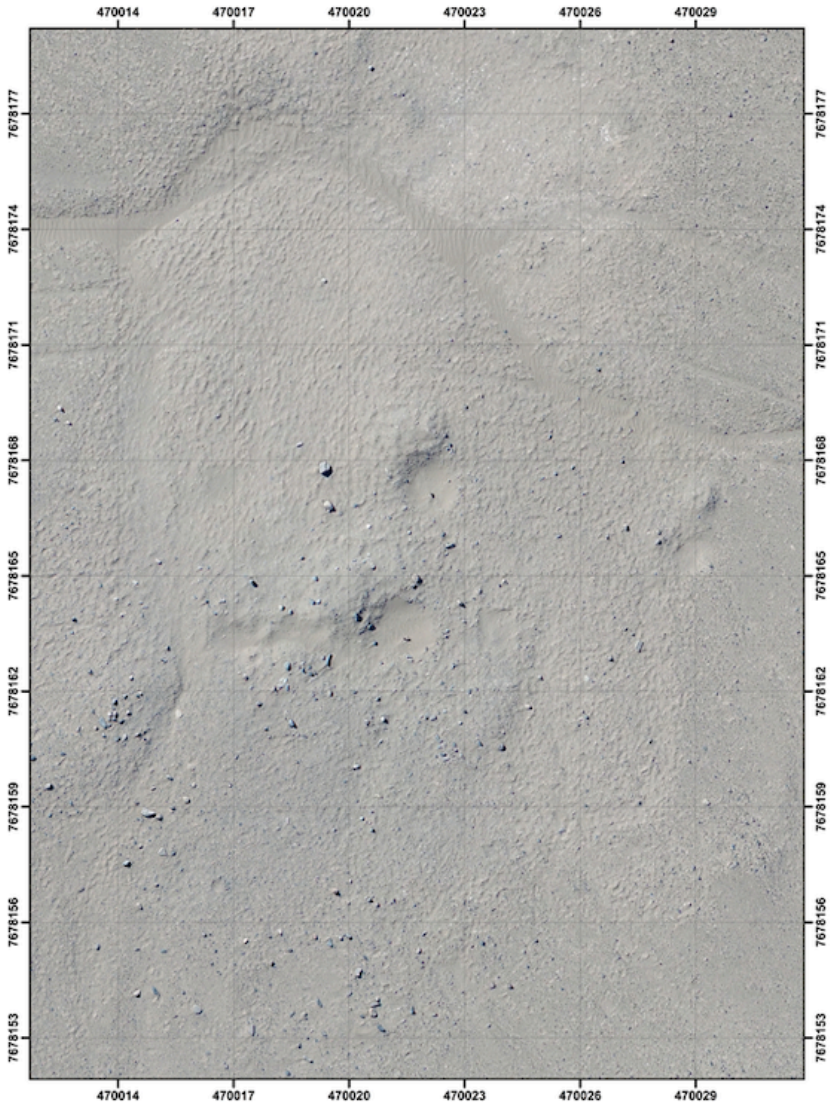



Figure A. 2. Photogrammetry of 01GUA027, an open-air site identified during the survey I conducted in the pampa outside G1.

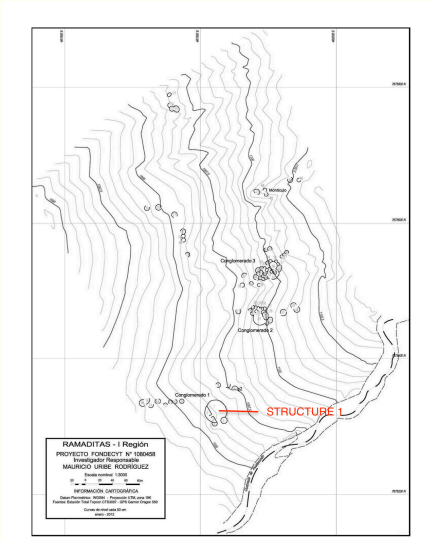
ID# 1

General | Structure | Wall: Constructive elements and geometry | Additional Features

Site RAMADITAS

Structure 1

Location




General Observations

This is the largest strcuture in the site. It was excavated by Rivera and his team (labeled "Plaza").

ID# 1

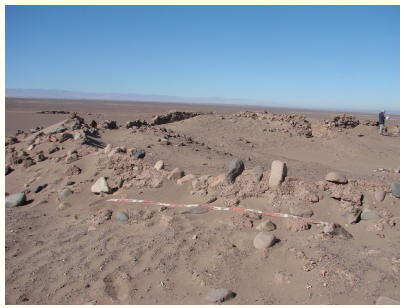
General | Structure | Wall: Constructive elements and geometry | Additional Features

STRUCTURE 1

1. Dimensions

| | |
|---|---|
| Width (m) | 25.2 |
| Length (m) | 27.8 |
| Diameter (m) | |
| Surface ($m^2$) | 700.6 |

2. Photo



3. Floor plan

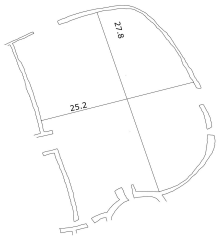



Figure A. 3. First part of the sheet used for recording architecture and other features at each archaeological site.

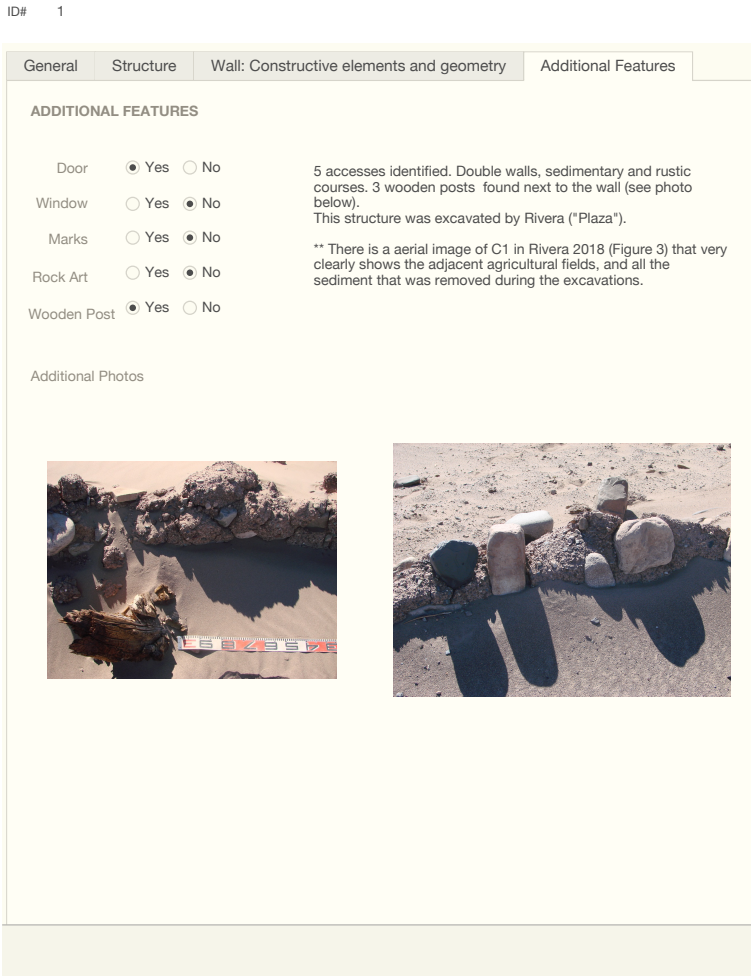




Figure A. 4. Second part of the sheet used for recording architecture in Guatacondo.

Table A. 2. Quantification of plant microfossils.

| Sample | Source | Building type | Phytol. | Starch | Tissue | Pollen | Micro-carb | TOTAL |
|---|---|---|---|---|---|---|---|---|
| 1-R (A) | C1-Strc 3 W Wall | NM | 6 | - | - | 35 | >100 | 141 |
| 1-R (B) | C1-Strc 3 W Wall | NM | - | - | - | 24 | >100 | 124 |
| 8-R | C3-Strc 51 E Wall (mortar) | NM | 6 | - | - | 25 | >100 | 131 |
| 18-R (A) | C2-Strc 17 W Wall | NM | 2 | - | 1 | 33 | >100 | 136 |
| 18-R (B) | C2-Strc 17 SW Wall | NM | 10 | - | 1 | 40 | >100 | 151 |
| 18-R (C) | C2-Strc 17 Window | NM | 3 | - | - | 36 | >100 | 139 |
| 19-R | C3-Strc 49 N Wall | NM | 6 | - | - | 31 | >100 | 137 |
| 22-R | C3-Strc 51 E Wall (mud brick) | M | 11 | - | 3 | 30 | >100 | 144 |
| REF-R | | Soil | 4 | - | 2 | 20 | >100 | 126 |
| 11-G2 (A) | W Wall | n/o | 22 | 1 | - | - | 68 | 91 |
| 11-G2 (B) | W Wall | n/o | - | 3 | 1 | 7 | >100 | 111 |
| 12-G1 | Strc 31-S Wall | NM | 1 | - | - | 8 | 45 | 54 |
| 13-G1 | Strc 113- E Wall | NM | 1 | - | - | 11 | >100 | 112 |

Table A. 2. Quantification of plant microfossils, continued.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| -G1 | Strc 174- W Wall | NM | - | - | - | 7 | 55 | 62 |
| 15-G1 | Strc 42-N Wall | NM | - | 1 | 3 | 30 | >100 | 134 |
| 17-G4 | Central-E Wall | n/o | 1 | 1 | - | 1 | >100 | 103 |
| TOTAL | | | 73 | 6 | 11 | 338 | 1468 | 1896 |