The potters' perspectives: A vibrant chronology of ceramic manufacturing practices in the valley of Juigalpa, Chontales, Nicaragua (cal 300 CE - present)

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3 Just a matter of time?

The first definition of the discipline of archaeology that I was exposed to was the "(...) study of past societies primarily through their material remains—the buildings, tools, and other artifacts that constitute what is known as the *material culture* left over from former societies" (Renfrew & Bahn 1992, 9). Even though this is a very basic conceptualization of our discipline, and several alternative and more theoretically updated definitions have been proposed in the past few decades (for example, Joyce 2016, 8), the characterization of archaeology almost always includes the notions of past and material remains. But what is the past? Is it really detached from the present and the future? And what are these material remains, what is materiality, how does it come into being? Is it discretely bounded or continuously unfolding? How do the trajectories of materiality and human communities intersect? Are these itineraries actually separate? How can materiality serve as a tool for studying temporalities? What is time, and how can research into ceramics be employed to answer any of these questions?

According to the Oxford English Dictionary (2010), time is "the indefinite continued progress of existence and events in the past, present, and future regarded as a whole." This definition implies a flow, an unstopped movement, and poses a problem that is fundamental to archaeology: the denial of duration. One of the earliest Western definitions of time can aid us in explaining this issue. For Aristotle, "(...) time is the number of motion in respect of before and after" (Annas 1975, 97). Since the present cannot be considered part of time, the movement between before and after defines time. In a way, then, time is the past, because we can only define it in relationship to its past trajectories. In order to make sense of this, we think of specific events or moments as points in an imaginary timeline. However, we do not stop to debate about the duration of the interval between points, and hence about the different itineraries between points. Apart from this linear conception of time, we—archaeologists—also have a cyclical notion of time, in which events "repeat" in set intervals.

Consequently, I will start this chapter by briefly discussing the different conceptualizations of time in archaeology, primarily in regards to the construction of chronologies and stressing Braudel's three timescales (Bintliff 1991; Knapp 1992; Holtorf 1996; Lucas 2005; 2008; Bailey 2007). At this point, I will provide a short summary of the ways in which archaeologists have organized materiality—mainly focusing on ceramics—in chronological models that, organized into periods, stages, phases, or horizons, explain continuity and change through time. Then, I will explore issues concerning materiality (Appadurai 1986; Kopytoff 1986; Ingold 2007a) and its relationships with time through the notions of palimpsest (Olivier 2011) and memory (Connerton 1989; Nora 1989; Pauketat 2014). Through an alternative view of materiality as a mutual constitution of humans and things (Ingold 2007a), as the non-dichotomous flow of interweaving itineraries of bodies and objects, referred to here as embodiment (Cresswell 2012), I will argue that the ways archaeologists have traditionally constructed their chronologies is conceptually limited. Bodies move and make things according to socially learnt practices; therefore, learning processes are situated in a cultural context (Lave & Wenger 1991), in times and places, in a continuous state of becoming. We learn how to make things; we learn a craft, a technology within a community. Consequently, identities are learned, embodied, and performed through differentiated materialities (Basu & Coleman 2008). The study of different ways of embodying materials, or of the groups that, through shared learning processes, form communities of practices (Wenger-Trayner & Wenger-Trayner 2015), through the lens of an anthropology of techniques approach

(Lemonnier 1986), can aid in the construction of alternative chronological narratives.

Traditional ceramic chronologies fail at encompassing the palimpsestic complexity of materiality, not only because they mainly focus on formal characteristics of vessels, such as shape and decoration, but also because typological or modal discourses rely on a basic bias that assumes that all types or modes go through a history that involves their introduction, popularization, decline, and disappearance (Nelson 1916).[37] The abuse of diffusionism in the past has obscured and flattened local processes by applying culture-historical and specifically culture area paradigms. The typologies used to organize time in archaeology generally do not take into account that bodily practices and ways of making have cultural signatures, or technical styles (Roux 2016), that have their own history, which also includes histories of aesthetic appreciation expressed through beauty and craftsmanship.

The study of ceramic production through the disentanglement of the manufacturing steps practiced by communities of potters, or the operational sequence, is just one of the many itineraries to take into account in the construction of a chronological overview of an area. However, even when constructing a chronological narrative that is mainly based on ceramic manufacture, it is also essential to take the differentiated itineraries of other practices into account, such as lithic production, mound construction techniques, and foodways. Some insights into social organization will be considered, as well as both brisk and more long-term, slow moving processes, such as volcanic eruptions or deforestation. This history of the different itineraries of intersecting practices will be conceived through an approach that views chronological narratives as vibrant and vital (*sensu* Bennett 2010), that, instead of focusing on simplified, inert, passive, and inactive aspects of pottery, aims to describe a world in which materials and practices are lively and interwoven. For this, I will attempt to construct a chronological narrative that goes beyond chronographies and periodizations and instead integrates the different trajectories of ceramic manufacturing practices with the palimpsest of present materialities.

37 These biases related to ceramic typologies, established by Nelson more than a century ago, continue to be assumed in chronology building.

3.1 TIME, ARCHAEOLOGY, AND OBLIVION

During the hype of processual archaeology, F. Plog strongly questioned the conceptions of time in archaeology, which he characterized as myopic and linear (Plog 1973). According to this view, time is simply a line connecting points, for which the starting point is the past, the end point is the present and the direction of the arrow indicates the future, which is precisely where the line moves towards. Time is then movement; it is linear, and the "moments" are tacks that mark an instant, a point. We cannot apprehend the present because it is always going away. As Borges (1968) beautifully said to us many decades ago, the present is ungraspable, which is why a philosophical school in India directly denies it.[38] Regarding this linearity, Plog provides a rather illuminating example that strongly corroborates recent criticisms of ethnoarchaeology (Gosselain 2016). Plog says: imagine that we do ethnographic fieldwork in community X. After 10 or 20 years without returning, we do another study in the same community. At the beginning of our investigation, we observe a clear increase in the dependence on agriculture. Most likely, we will infer that this increase had a linear trajectory. And here comes the genius of Plog, which closely resembles many of Tim Ingold's reflections, made 45 years later: "Unfortunately, while two points provide a minimal definition for a straight line, they do not necessarily define a straight line. Lines of many different shapes could connect the two points; dependence on agriculture could have varied significantly rather than increasing regularly" (Plog 1973, 187).

Although Plog seems to omit—apparently intentionally—the suspicious similarity between this type of inference and those of gradual evolutionary thinking, as well as the fact that the idea of the two points in itself, the author illustrates the simple objection that the sequences of events that can produce the same patterns are various. For Plog, even though human behavior does not follow a unilinear pattern, that does not mean that it is random, and archaeologists have a unique privilege as a discipline; they can study the processes of change, and thanks to this, it is possible to argue why certain sequences of events, or individual events, and their associated practices, were more likely to have occurred than others.

38 I will return to the present in a few "moments".

This reflection is very encouraging for research focused on chronology because the trajectories of different kinds of events, actions, and practices can be highly capricious, although simultaneously constricted and enabled by certain universes of possibilities. Humans are born in a particular context in which they learn how to belong to their group (Lave & Wenger 1991), and they are taught the different legitimated ways of embodying it, so this context is empowering yet at the same time constricts the possibilities to break with those learned ways of doing everything humans do. Even the materialities that are part of this incorporated universe are made possible and continually re-produced through this repetition of practices. However, the relationships between structure, actions, and practices are dialectical rather than unilinear (Joyce 2004; Sassaman 2010). Let's illustrate this with a simple and contemporary example.

In 1990, the government of Carlos Menem, following the *menemista* decalogue as defined by Roberto Dromi, privatized all state companies belonging to the Argentinian government and people. Public opinion was divided; on the one hand, there were strong arguments in favor of privatization, mainly based on the fact that public companies were in debt. On the other hand, many citizens were concerned about the upcoming massive loss of jobs and the liberalization of public assets. The works of TELECOM, a telecommunications company with French, Italian, North American, and Argentine capitals, included, among other things, the renewal of telephone wiring. Suddenly, the streets of my hometown Rosario were flooded with thin steel cables covered by brightly colored rubber. The practice of collecting the cables to make bracelets immediately became fashionable among kids at schools, neighborhoods, and sports clubs. Children wore those bracelets with the pride of craftsmen. The most original patterns received praises at the school courtyards; teachers, friends, parents, and grandparents received special ones as tokens of affection. Even though wearing a steel cable on the wrist or ankle is not precisely comfortable, that did not discourage the practice. Certain innovations were generated, such as the variant of necklaces and earrings. However, bracelets were the most common "type" of object. The colored wires that were harder to get were exchanged at recess. A whole system of value was created, where a certain amount of one color was worth some quantity of another.

How can we explain these practices? The idea that the generation that grew up during the privatizations of the 1990s created bodily ornaments with the waste left on the streets by the new private company—which eventually charged the most expensive telephone service in all of Latin America and then went bankrupt during the crisis of 2001—is poetically attractive. However, what can we actually infer about the trajectories that resulted in these bracelets? And where are these bracelets now? A fast inquiry regarding the bracelets' whereabouts was unsuccessful, and at first glance, nobody seems to have written anything about "bracelets with cables from Telecom Argentina". Apparently, time has erased them. Maybe we—the generation of Argentinians who grew up in the 90's—have forgotten about the bracelets, but, when prompted, we immediately remember them. We forgot them because they are not part of our present; they are not a part of our current universe of daily experiences. When we walk in the streets today, we no longer see hundreds of TELECOM workers with their trucks, flooding our streets with colorful wire. We do not hear journalists discuss the pros and cons of privatization, and "De música ligera" is not playing in our heads 24/7 anymore. It is not our present; it is our past. Maybe it is not possible to speak of the present without thinking of the past and the future.

Deeper discussions regarding the notions of time in archeology are quite recent (Lucas 2005, 2008; Bailey 2007) and deal with both our conceptions as archaeologists (Gosden 1994; Holtorf 1996) and how they structure our narratives about historical evolution,[39] as well as the differing views about the past in different human groups (Gosden & Lock 1998). Our vision of chronology, which relies on the science of computing dates, matches these conceptions, since we construct chronologies as directional, linear movements split into various divisions (Lucas 2005). We tend to glue the cyclical dimension of time (for example, the seasons), awkwardly on this timeline. For that reason, we use spatial patterns to infer temporal ones (Plog 1973). In both absolute and relative chronologies, we associate space and time, while we simultaneously neglect duration. In the case of relative chronologies, loci such as layers (stratigraphy), as well as the position of certain modes or types in ceramics (presence/absence, seriation)

39 I am referring here to evolution as a synonym of change, in the absence of a better translation from the Spanish concept of "*devenir histórico*", which translate almost literally as historical becoming.

mark temporality; the same assumptions are inherent in absolute dating techniques, which connect datable materials found in a specific spatial position with a more or less specific date. In this sense, the space-time continuum (Einsten & Lawson 1921), a physical model that fuses spatial and temporal dimensions, is not an alien concept in archaeology; we cannot think of time divorced from space. At the same time, we cannot observe space without looking at time. When we make temporal inferences, we connect the different points (types, bones, modes, pieces of charcoal, etc.) with a line that represents time and processes of change. However, as archaeologists, we are faced with the fact that what we investigate cannot be translated into one single line of time, because different processes actually operate at different temporal scales and rhythms (Smith 1992; Bailey 2007).

In this sense, the work of historian Ferdinard Braudel (Braudel 1949) is of fundamental use to archaeologists. The relevance of his work not only lies in his proposal of three different time scales, but also in his insights into duration as the inner dialectic between different temporalities. These two ideas, in a way, revolutionized how we look at time from an archaeological standpoint. Unfortunately, this has not resulted in an updated chronology building effort from within our discipline, but rather a reinterpretation of old chronological models with new vocabulary (at least for southern Central American archaeology). Chronologies are still mainly based on ceramic formal attributes and expressed in charts. A true revolution, though, would smash the pillars of narrative structure and replace it with a completely new *grammatica*. But we will return to that later; for now, we will focus on Braudel's different time scales, which are hierarchical because they constrain each other (Knapp 1992). In summary, the author proposed three interconnecting scales of time: first, the *longue durée*, which is comprised of long-term, slow-moving processes, which include many geographic and environmental ones but also *mentalités*. Second, the *moyenne durée*, or *conjonctures*, which are the medium-term cycles (several generations or centuries) related to social structures that mold, constrain, and alter the boundaries of human lifeways. The third and last, *l'histoire événementielle*, refers to individual actions, events, and personalities. It is difficult to see how our Cartesian, two-dimensional chronologies with a vertical sense of time that deals little with duration can encompass this more complex, multidimensional overview of time.

This model, which is based on change, was the foundation of the *Annales* historiographic school. This program, through its "total history" objective, brought multidisciplinarity to historical methods and combined microstudies with inquiries into structure and longer-term processes, as well as turned the lens of history on ordinary people and their daily lifeways. As Leone pointed out, "with its emphasis on time, space and change, archaeology is structurally similar to history" (Leone 1978, 30), so it is not surprising that the *Annales* school also had a deep impact in archaeological thought (Bintliff 1991; Knapp 1992; Smith 1992). Archaeological inquiry has also influenced the *Annales* perspective of multi temporality through the study of the palimpsestic nature of materiality, from a practice theory, or embodied, point of view.

3.2 HOW THE PRESENT BECAME THE PAST: THINGS AS PALIMPSESTS

> "(...) 'Nature has no history'. The laws of Nature are timeless truths. For history, time is the great reality; and the future is the infinite well-spring of those events which, when they happen, become present, and whose traces left upon the present enable us to reconstruct them when they are past." (Collingwood 1927, 319).

The definition of archaeology as a discipline, as stated in the paragraphs above, deals with temporalities and materiality. In the previous section, I outlined some discussions regarding our conception of time(s). I will start this new section by briefly analyzing Collingwoods' divide between past and present. For him, when events happen, they are the present, and after they finish, they become the past. In this sense, our view of the archaeological record, of the "material traces left by past societies" as products of the past, makes sense, but if behavior in a specific context of space-time represents the intersection and interweaving of various processes, with differential temporal rhythms that operate in dissimilar time spans and with different frequencies and amplitude in their variability, maybe the point where we can actually observe their interaction and combined

effects is in the intersection with the present (Bailey 2007, 214). In that sense, "the material world is of necessity, a composite of objects of differential duration, which represent at the very least either temporal palimpsests or palimpsests of meaning" (Bailey 2007, 209). Palimpsests are "the traces of multiple, overlapping activities over variable periods of time and the variable erasing of earlier traces" (Lucas 2005, 37), so in this sense, present materiality is multi-temporal. "*Le passé est dans le présent, comme une mémoire au présent, mais l'inverse est vrai également: si le présent contient des eclats du passé, le passé contient également de l'actuel, de l'<<a-present>>*" (Olivier 2011, 319). Consequently, the dichotomy between past and present blurs; the fragments of the past are inscribed in the materiality of the present (Olivier 2011, 319). We live in a material palimpsest; the archaeological record is a palimpsest that also incorporates the archaeologist who unearths material remains. Archaeology, then, studies this entire palimpsestic material record.

The decision to define palimpsests based on Lucas was pragmatic, since I wanted to avoid the discussion of the term itself,[40] which exceeds the objective of this section, and move on to the temporal implications that are the focus of my research. However, I did review alternative definitions such as the one presented by the Oxford dictionary, which characterizes palimpsests as "something reused or altered but still bearing visible traces of its earlier form" (Oxford English Dictionary 2020). According to the Merriam-Webster dictionary, a palimpsest is "something having usually diverse layers or aspects apparent beneath the surface" (Merriam-Webster 2020). All definitions agree on the deposition of layers of different temporalities in the same location. Curiously, these conceptualizations are suspiciously similar to our understandings of stratigraphy. Bailey (2007) builds on Lucas' definition of palimpsest but stresses two main aspects: the erasure of older information in contrast to the preservation of the newest traces and the fact that actually not all of the oldest information is deleted, so there is both an accumulation and transformation of activities resulting in a totality that is different and greater than its constituents (Bailey 2007, 203). Therefore, Lucas' definition seemed like the most appropriate; however, it was limited in the sense that—unlike Bailey's five categories of palimpsests—it did not delve deep into the various temporal palimpsestic qualities of the world we inhabit, which is a world of materials (Ingold 2007a, 14) and therefore an archaeological world. When observed through Braudelian lenses, these palimpsestic attributes can be understood in their three different time scales: the eventual or more individual, the conjectural or "social", and the *longue durée* or "environmental". Let's take a pot sherd as an example, with the dual aim to apply these thoughts to the subject of this book and to compare and contrast our views with other stories archaeologists have told about pot sherds (see Holtorf 2002 for an example).

In the eventual time scale, the ceramic fragment was first conceived by a potter, who followed the production process learned from—most possibly—his or her immediate social context. These manufacturing steps involve particular manners of relating to the landscape, which can be assessed through the study of the procurement of the materials employed during the manufacturing process; the other materials that are sought and found during these prospections that might relate or not to ceramic manufacture; and the intersection between production loci with water and fuel availability, or hunting and gathering practices, for instance. Also, these ways of doing imply motor habits, bodily gestures, and technical styles that are signatures of situated learning and therefore of the potter's overlapping identities.[41] The use of the vessel, on the other hand, can also be seen through the conjectural scale of time, in which, for example, these receptacles could have functioned as mortuary containers of human remains. This tradition, which outlives—and probably buries—the potter, might be shared with other communities of potters, who actually manufacture their vessels in distinctive ways. In turn, the differential technical aspects of ceramic manufacture might change through time in each community of potters due to diverse factors such as transmission, innovation, or technical transfer; however, in this exercise of our imagination, people keep being buried in pots. Then, this same pot sherd that was conceptualized and realized by the

40 The word comes from the Greek term *palimpsēstos*, which integrates *palin* (again) and *psēstos* (rubbed), referring to superimposed previously erased writings (Oxford English Dictionary 2020).

41 It is also possible that the potter might have adopted ways of doing that are different from the one he learned within his first social circle. For example, after marriage, some women re-learn the craft from their mothers-in-law (see Herbich 1987 as an example).

potter's hand, that then contained human remains, is later subject to several taphonomic processes, which involve our deepest time scale, the *longue durée*.

This example of the sherd is actually partial, and in a way delves into the three temporal scales in a reductionist and flat sense, without taking into account their intersections and interweavings. This is the way in which Braudel's vision has been applied to chronology in archaeology, without really challenging our analogy between stratigraphic columns and the real complexity of the histories we are trying to write. In these Cartesian chronological constructions, imaginary points in time (usually layers, artifacts, organic remains) that are dated through absolute methods, ignoring their probabilistic nature (Joyce 2016), comprise compartments—usually quadrangular and vertical—that correspond to phases, horizons, or periods. The lines that break these divisions do not allow overlapping; in the type-variety system of ceramic classification, for instance, pottery with exactly the same characteristics will even be named differently if it appears in another "period". These boundaries also oppose past from present, as well as distinguishing different pasts from each other. It seems that, paradoxically, our manner of conceiving, constructing, and thinking through chronologies represses temporality, which is maybe a legacy from the exclusion of time in social theory, as pointed out by Giddens (1979, 7) and Fabian (2014). Therefore, it is pertinent to ask ourselves how a truly Braudelian chronology should not only narrate the palimpsestic archaeological world, but also graphically express it. In this section, I will try to answer the first part of this challenge, and I will leave the second part for Chapter 8.

So let's go back to our potsherd. We should have actually started its story with the *longue durée*, with processes such as magma flowing, volcanic eruptions, erosion, transport, rain, and soil formation, which are some of the ways in which our potter's clay, potential tempering materials, water, and fuel came into being by the time he or she ventured into the geologic prospection that led to raw material collection.[42] Then, maybe the intended aim of the vessel was mortuary, or maybe our potter did not have one sole objective in mind: it might be possible that the vessel was intended to be used for multiple purposes, and that generations after the manufacturer—if the pot survives, and even if it does not!—will also use it in various ways for which it was not necessarily intended, depending on how it relates to other vessels, landscapes, people, and their doings (Tilley 2007). The pot might also travel as a container of desired goods to and through places far away from its production context. All of these possible scenarios entail participation in constellations of practices and even maybe in networks of practices, which tell us about the conjectural time scale.[43] After its use, discard, and potential re-use(s), our small protagonist might actually be "born" and immediately start suffering from several processes that bring us back to the *longue durée*: volcanic eruptions, erosion, transport, rain, flooding, soil formation processes, bio-turbations, etc. Eventually, I dig it up, clean it, bag it, wash it, label it—adding a new layer to its material palimpsestic ontology—export it, examine it at the lab, take pictures of it, make drawings of it, cut it for thin section petrography—sometimes accidentally destroying it—store it in a box, and possibly let it reside at a storage facility for the "time being". Unless I write about it somewhere and someone reads about it, it will be forgotten until someone needs more space at the storage facility or decides to study it again a few decades after my brief—yet relevant—interaction with it. In this way, the three time scales are omnipresent… they are always and everywhere present.

So far, I have concentrated so much on the overlapping temporalities of our palimpsestic pot sherd that I have reduced the vast richness of our little friend's history to only one aspect. The pot sherd is not only traveling one temporal journey, but actually several trajectories that are bundled together (which do not form a nice, simple line between two points). Such trajectories are physicochemical, like the transformations from magma to rock, from rock to clay, from clay to pot, from pot to sherd; and some imply different meanings, like mother earth, ancestors, gods, heritage, statistical variables, etc. Even my decision to classify the story about this material congealment as the story of a pot sherd is completely arbitrary because I hierarchized the duration between the breakage of the vessel and the present over its magma, rock, mineral, clay, vessel, trash, or tool ontologies. The biographies of things (Kopytoff 1986) as well as their social histories

42 I am intentionally not referring to sedimentary or metamorphic processes to avoid confusion.

43 See 3.3.1 for definitions of constellations and networks of practices.

(Appadurai 1986) are therefore complex meshes bundling the trajectories of different itineraries in various temporalities. Environmental processes, production, consumption, discard, re-use, deposition, archaeological find, laboratory, museum, depo are only some of these intersecting threads that, over different temporalities, participate in the weaving of the biography of a pot sherd.

The idea of materials as palimpsests was already somewhat pointed out by Bailey (2007) with his five different categories of palimpsests: true, cumulative, spatial, temporal, and meaning. His categories already account for differential itineraries that node together; however, I propose a more radical view rooted in the palimpsestic ontology—or being—of materiality outlined above. Matter is becoming (Barad 2003, 822); mattering is the combination of "(...) complex traces of actions and inactions at some past time" (Joyce 2016, 11). I will consciously use the term materiality because it matches not only the new materialism views mentioned above but also Tim Ingold's views. In his rejection of dichotomies such as body and mind, human bodies and things, and views of the properties of materials not as attributes, the author suggests to drop the term materiality (Ingold 2007a; 2010). However, if used without dichotomies such as the "(...) physical components of the environment *and* the social practices enacted in that environment" (Jones 2004, 330),[44] or the flow of intersecting itineraries of bodies *and* objects (Cresswell 2012), then materiality can be an empowering category in archaeology (Knappett 2007; Tilley 2007). And materiality is palimpsestic; each category in Bailey's (2007) classification is actually a grid. For example, temporal palimpsests are multiple and involve different scales and rhythms.

All of the reflections outlined above demand a slightly more complex definition of archaeology than the one outlined at the beginning of this section. Archaeology can then be conceived of as the "(...) practice of *tracing* the intersections of *temporalities* of *materialities*, including those making up the *bodies* of human beings, and their congealing as sites" (Joyce 2016, 8).[45] Our chronologies cannot consist of vertical two-dimensional charts that ignore the palimpsestic ontology of materiality. Earlier chrono-narratives based on ideas that see the shape of the vessels and decorative styles, for example, as proxies for social transformations are the best example of this discrepancy between the progress in archaeological theory in the past decades and the need for revolutionizing our discipline from the bottom up, revising what we take for granted, which includes the allegiance to ceramic seriation (Rowe 1961; Marquardt 1978; Willey & Sabloff 1980) as a powerful relative dating technique. We have swum long enough in our sea of temporalities, so now might be the right time to "swim in an ocean of [palimpsestic] materials" (Ingold 2007a, 7).

3.3 INCORPORATED HISTORIES

A chronological effort rooted in the palimpsestic ontology of materialities faces many paradigmatic obstacles. I use the term paradigm in Giorgio Agamben's sense (Agamben 2010) and not following Kuhn's view (Kuhn 2004; Donner 2015, 72-82), and I propose that chronology building in archaeology is a paradigm in and of itself. This paradigm has remained unchanged in spite of a long history of development of archaeological theory, which is evinced by the simple fact that chronological charts have remained conceptually unchanged. New data is constantly added, but the geometrical construct of time stays graphically and therefore metaphorically unquestioned.

In order to fully analyze this paradigm, it would be necessary to carry out a thorough discursive analysis, which would entail five different aspects. First, an evaluation of its discursive formations, understood as the principles that govern our chronological discourse. Second, the enunciation of its general rules, such as the conceptions of time, the Cartesian expression of chronological charts, or the view of absolute dates as points. Third, the study of the surfaces of emergence, which refer to the conditions (historical, paradigmatic, discursive) in which objects of discourse arise. Then, the authorities of delimitation, which would assess who the legitimized agents are that establish the objects of discourse; and finally the grids of specification, or the systems of chronological classifications (Foucault 2005). However, that would be the purpose of another manuscript. Therefore, I will focus on articulating the relationship among certain objects of discourse, such as materiality, embodiment, practice, *chaîne opératoire*, biographies of things, communities,

44 The emphasis is mine.
45 The emphasis is mine.

constellations, and networks of practices, style, and chronology into a different paradigm. This discourse formation with its own units, modalities, rules, and relationships reflects on the conceptualization and representation of time in archaeological practice from fieldwork to literature.

3.3.1 WE MATTER

So far, I have talked about materiality at a distance; although I have tried not to dichotomize body and mind, I have not yet sufficiently addressed our corporeal—and hence material—ontology as humans. We do not exist on 'the other side' of materiality, our form, as the form of all other things, "(...) far from having been imposed from without upon an inert substrate, arise and are borne along (...) within this current of materials" (Ingold 2007a, 11). We, people, "(...) are present (...) in the same way that all living organisms are, as complex bundles constituted by the flows and transformations of materials across the interface between their bodily substances, and the media that surround them" (Ingold 2007b, 31). As we occur and unfold, as along with the other "bundles" we intersect with—and forgetting one of our first indoctrinations that splits our world into living and non-living things—we are not dead and inert. In this sense, agency is not our unique resuscitating and sustaining property (Ingold 2007a; 2010) because both things and people "(...) have mutual biographies which unfold in culturally specific ways" (Gosden & Marshall 1999, 173). In this sense, structure and agency are mediated through practice, meaning that while practice is conditioned by structure, it simultaneously reshapes and reproduces structure (Dietler & Herbich 1998, 245). In Gidden's words, "(...) structure is both medium and outcome of the reproduction of practices" (Giddens 1979, 5). And since the exercise of power is material, physical, and corporeal (Foucault 1980, 57-58), our bodies, understood as the sites of our lived experience (Joyce 2005, 151), do not merely signal social structure. In fact, social structure is actually inscribed in our bodies through *habitus*, or socially and therefore historical systems of dispositions (Bourdieu 1977; 1984). These habitual practices are "(...) the articulation of embodiment that is key to understanding the lived experience of social actors and, thus, (...) the formation of different identities" (Fisher & DiPaolo Loren 2003, 228). Here, we are then speaking of ways of doing and making things, ways of bundling different itineraries of things. In this sense, materiality is embodiment; the hands of the potter shape and are shaped by clay, water, tools, and sand. The different bodily gestures and movements that ceramic production entails are inscribed in the vessel, which is an embodiment of the potter's *modus operandi*, the situated social structure, and his or her overlapping identities. Learning a craft is therefore historically and socially situated; learning how to make things is part of learning how to become a member of a community of practitioners. I understand communities of practice as "(...) a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice" (Lave & Wenger 1991, 98), in which membership is processual. Becoming a member, the transition from newcomer to old timer, is conceptualized as legitimate peripheral participation, which is the "(...) interactive process in which the apprentice engages by simultaneously performing in several roles[,] (...) each implying a different sort of responsibility, a different set of role relations, and a different interactive involvement." (Lave & Wenger 1991, 23). Learning is then participating, both through understanding and experiencing, so it is never as simple as the transfer or assimilation of knowledge. Learning, transformation, and change are interwoven (Lave & Wenger 1991, 51-57). Therefore, tradition building, or cultural construction, is done through practice (Pauketat 2001). In the case of technical traditions, like ceramic manufacture, they constitute the "(...) arenas in which agents construct social identities and forge power relations while also producing and using utilitarian objects for practical ends" (Dobres 1999, 129). Some traditions are shared by several communities of practitioners. The microscale ways of doing might be particular to each community, but other, more macroscale practices may be common to all. Constellations of practices may result from collective historical roots, artifacts, conditions, members, resources, geographic proximity, interaction, or overlapping styles/discourses (Roddick 2009, 80). The bundling of constellations of practices, such as those at the community level, can be intentional or unintended (Joyce 2004; Roddick 2009). Another way in which communities and constellations of practices bundle together is through networks, which aim to understand the "(...) local histories at least in part through understanding relationships between places (and the people and significant things in different places), rather than by

attempting to trace and delimit territories as frames for localized, essentialized identities" (Joyce 2020). In these networks, nodes comprised of a combination of places, people, and time connect through flowing relationships (Joyce 2020).

In order to define a community of practitioners of pottery manufacture, it is necessary to dissect the ways of making things, which can be broken down into different steps that are followed to achieve a desired end product.[46] Accordingly, the operational sequence is defined as "(...) a series of operations that transforms *raw* materials into an *end* product, which is an object of consumption or a tool" (Creswell 1976, 13).[47] Similarly, Sillar and Tite (2000, 4) characterize it as a sequence of techniques to modify *raw* materials into a *final* product.

These definitions are by no means simple; even though they try to make a common-sense statement saying that to make something, you have to follow certain steps, they are also reproducing several of the notions regarding materiality that we have discussed above. To begin with, raw materials are opposed to the end or final products, instead of describing a becoming in which stone, hammer, hand, arm, gravity, sand, water all unfold into an axe. Raw materials are reduced as a source for creating something completely different, denying the previous histories that intersect. The processual ontology of manufacturing practices and the histories both before and after the production process are denied. Second, in these definitions of *chaîne opératoire,* humans are completely absent. For instance, in the first characterization, the subject of the sentence, the agent that transforms raw materials into a final product, is the series of operations. Human agency is reduced to operations and techniques to explain how things come into being. Finally, production and consumption are dichotomized (but see Borck & Mills 2017, 29-30). Even highly lucid approaches to ceramics, like Roddick's work in the Taraco peninsula in Bolivia (Roddick & Hastorf 2010), does not escape this problem. For the author, pottery production is "(...) a bodily practice, in which the subtle cultural choices in production are seen in changing paste recipes, firing patterns and surface finishes" (Roddick & Hastorf 2010, 159), while food preparation and consumption are "(...) also embodied and highly routinized; [they are] truly the most common bodily and social act, being both discursive and non-discursive" (Roddick & Hastorf 2010, 159). These trajectories of pottery manufacture, food preparation, and consumption presented by Roddick and Hastorf (2010) are parallel; they do not seem to intertwine. However, in practice, they do all the time; for example, the introduction of new vessel shapes, or the knowledge that certain tempering materials can aid in thermal shock resistance, and the choice to copy certain decorative techniques, not only transform the sequence of steps followed in pottery manufacture, but also have implications in culinary practices, differential foci of geological surveys, and other socially lived experiences.

As a field archaeologist, my own dichotomies between production and consumption were challenged during my first season in the valley of Juigalpa, in early 2015. In the course of the pedestrian survey, we interviewed many local residents and asked about potters in the region. This ethnoarchaeological effort led us to Antonia Villegas, a 68-year-old healer living in the San Isidro locality, just east of Aguas Buenas, across *La Garnacha* stream. She explained to me how she learned to make pots from her mother-in-law, who was a *locera*, and that she had not made a single vessel for the past twenty years.[48] The practice, which was never intended as a fulltime job for her, was abandoned for several reasons. First, the replacement of fired clay vessels with plastic and metallic ware; second, the resilience of her treasured big *cantaros*, where she stores water because they keep it cooler than vessels made of other materials; and the availability of cheap *comales* and *ollas* at the market in Juigalpa. After explaining the manufacturing process that she learned from her mother-in-law, Antonia told me how she used to fire big pots in an outside hearth, in the open, while she employed her stove—also made of clay, as the kitchen structure, both built with her own hands—for firing smaller vessels. Suddenly, the separation between production and consumption contexts and practices seemed trivial, and even though household production and consumption are widely reported worldwide (Hirth 2009), somehow their dichotomization creates a disconnected view of these practices, denying their intersecting trajectories. The same fallacy occurs when we conceive of potters

46 For a thorough discussion regarding the history of the concept of *chaîne opératoire*, see Delage (2017).

47 Translation and italics are mine.

48 In central Nicaragua, potters are known as *loceros* because they produce *loza*, which means "ware" in English.

as only potters, even though their lived experience usually entails and has entailed intermittent, multi, and inter crafting activities (Shimada 2007; Hirth 2009; Fredriksen *et al.* 2014). Classifying practices and crafters is a common disciplinary tool; however, assuming an automatic separation as a direct consequence of their definition is problematic.

For the purposes of this book, I will focus more on production-related practices, which will be linked to other trajectories of our pot sherds to avoid losing the bigger picture. However, a dive into ceramic manufacturing processes without taking into account the "end" product with its morphometric and decorative characteristics would be incomplete, so I will address these topics as well.

3.3.2 STYLE AS THE UNIVERSE OF WHAT IS POSSIBLE

The trajectories of steps required to make things are numerous.[49] These choices[50] consist of the socially acquired dispositions (Bourdieu 1977) that both enable and constrain the perceptions of what is possible (Dietler & Herbich 1994) regarding all itineraries of the pot's life, including the different steps in its manufacture, the embodied aesthetics of the final product, and the next stages in its biography. Crafters learn the realm of these possibilities, which are socially and historically situated, during the process undertaken in order to become part of the communities of practitioners of pottery manufacture. This learning process, as characterized above, is called legitimate peripheral participation, and it consists in the acquisition of skills related to the routinized and often unconscious situated bodily gestures of doing things (Sackett 1977; Wiessner 1985). Style in this sense is defined by what is possible, so in a way it has a very similar trajectory to discourse, understood as enunciates subjected to a set of rules that define the regime of objects (Foucault 2005). A discourse delimits what is said, how it is said, and what is included in and excluded from what is being said. Style, then, constrains and enables what is done, how it is done, what is included in and excluded from what is being done; it is a non-dichotomous intersection of practices of bodily incorporation and inscription (Connerton 1989).

Since everything is discursive, style is the articulation of some aspects of social structure. From an archaeologist's point of view, style can then be conceived as "(...) the manifest expression, on the behavioral level, of cultural patterning that is usually neither cognitively known nor even knowable by members of a cultural community" (Lechtman 1977, 4). Therefore, style is inherent in all variation (Sackett 1977, 378), but contrary to its first conceptualizations (Sackett 1982, 154), it is not a direct diagnostic of ethnicity. Rather, it can also be related to information exchange (Wobst 1977), and it is therefore not reduced to aesthetic choices. Also, there is not necessarily a division between function and style, as outlined by Wiessner (1985). In fact, ethnoarchaeological studies suggest that variability in material culture patternings is related to the arbitrariness in technological gestures (Stark 1998, 5-6). Consequently, the traditional dichotomy between style and function, which equates the former with decoration and micromorphological features, is not conclusive. Artifact variability is actually related to technical choices (production) and to consumption choices (Gosselain 1998; Stark 1998), so it does not directly signal identity either. In fact, equating style to culture is a simplistic approach (Wobst 1977, 328). Style "(...) is to be located in those attributes of objects that have no discernible role in affecting their utilitarian performance in the context of use (the domain of function) and that do not result from technical constraints in the context of their manufacture (the domain of technology)" (Dietler & Herbich 1998, 237). Despite these many critiques, the fundamental building blocks of most chronological endeavours based on ceramics, at least for pre-Hispanic Nicaragua, have been built upon decoration and formal variation (see Chapter 2). That is to say that variability in these two aspects was interpreted as a proxy for social transformations (see Geurds & van Broekhoven 2010 for an alternative interpretation).

Ethnoarchaeological work in subSaharan Africa established two decades ago that the steps of the manufacturing process that do not imply specific motor habits and are performed in the open might invite collaboration among potters and other social actors, so stages in the production process such as decoration, clay processing, firing, and perspiring constitute moments in which new ideas and attitudes can be adopted, regardless of the level of training of the potter (Gosselain 1998). On the contrary, techniques used for fashioning the vessels are more resistant

49 See 3.3.3 for a full description of the ceramic production process.

50 Choice is addressed here in a non-idealistic way (Binford 1989).

to change, probably because they do essentially rely on motor habits (see Arnold 1981; 1985, 235-237; 1989; Foster 1965; Nicklin 1971). Moreover, they are associated with one of the most personal and least symbolically invested operations of the *chaîne opératoire*. These reasons may explain their frequent correlation with larger and more pervasive forms of social ties, such as linguistic affiliation" (Gosselain 1998, 102). Concurrently, the anthropology of technology approach, as proposed by Lemmonier "(...) is the study of the relationships between technological systems and society" (Lemonnier 1989, 156), taking into account not only the reciprocal effects between technological and social systems, but also the physical aspects of material culture. However, this focus on technological systems might represent a bias from our own Western culture, in which technology and society are viewed as oppositional (Hegmon 1998, 156).

Without getting into the debate currently surrounding ethnoarchaeological work in ceramic production (Gosselain 2016; Roux 2018), in my opinion, its greatest contribution is the realization that the borders of territories and groups—which include temporal borders—although clearly important to people, are not necessarily reflected in the distribution of ceramic styles as conceptualized by archaeologists (Gelbert 2003); the boundaries of style zones can fall in areas which are of no cultural or social significance and sometimes relate more to networks of personal interaction among potters, implying face-to-face situations (Dietler & Herbich 1994, 469). Therefore, an "(...) integrated view of material style encompassing patterning in technological, formal, and decorative aspects" (Dietler & Herbich 1998, 238) is more suitable for understanding variability than the focus on arbitrary formal characteristics. To summarize, style is habitual, corporeal, technological, socially and temporally situated; style is what is accepted as the norm, as the proxy, as how things should be done and what they should look like. Style signates the bodily gestures of the potter and also the manner in which the food or drinks contained in the vessels are enjoyed. Style is a powerful category when used without reducing it to aesthetics or technology; therefore, it cannot be simplified into only decoration, shape, size, or technique. Style determines the universe of what is possible, so studying variability entails shedding light into the subtle and complex changes in many interweaving trajectories that, in their becoming, are constantly re-questioning and transforming what is it that is possible.

3.3.3 STEP BY STEP: OPERATIONAL SEQUENCE

Before describing the ceramic production process, it is important to explain what I want to mean by ceramic vessels, or sherds, which are the pieces of broken pots that archaeologists find. To do so, I will exercise some story telling, inspired by the writings of Tim Ingold (Ingold 2007a; 2007b; 2010) and partially by Holtorf (2002). The protagonist of our journey is again the pot sherd, now seen through technological eyes. As I addressed in Chapter 2, let's say our story goes back to the Late Oligocene, around 28 million years ago, when the volcanic activity of the study area started the long process that formed most of the rocks found on the surface today. The formation of these rocks provided the volcanic mineral signature for the majority of the soils that we walk on nowadays. Some of these soils became clay thanks to the combination of water, wind, sunlight, fine-grained rock, clay minerals, quartz, metal oxides, and organic matter. Clay, in turn, can become many different things; that is to say, clay *entangles*[51] many possibilities, depending on different technological flows. In this sense, clay has its own *properties* as a material. The various and often interwoven trajectories of clay can include phases in which it becomes a *surface* (i.e. the ground beneath our feet), but it can also become a *substance* (i.e. mud, house wall, kiln) (Gibson 1979; Ingold 2007a; 2007b). When its trajectory coincides with a potter who intends to make a vessel, fuel and fire, it can unfold into ceramics. If fired under specific circumstances, it will turn into porcelain. Therefore, clay is a thing that can unfold into different other things, that are still clay but only partially, because they become actually a *bundle* of many things intertwined together. In order to understand the different lines that form this bundle, I will unfold the ceramic manufacturing process to illustrate how ceramic *becomes* (rather than is) ceramic. To do so, I will follow V. Roux's conceptualization and terminology for the *chaîne opératoire* of ceramic production (Tixier 1967; Roux 2016). Literature is extensive on this topic, but the decision to follow Roux's outline is directly connected to the methodological choices described in Chapter 6, with my objective of following a practitioner's perspective (Keller

51 In Hodder's sense, meaning that clay entraps both enabling and constraining forms of dependence (Gosden 1994, 77; Hodder 2014, 20).

2001). The description of this process does not mean that ceramic manufacture depends on the presence of each step; in fact, some of them are not essential for achieving an end product but are more related to functional or cultural choices. Also, different parts of the vessel (base, body, neck, for example), can be made following different steps, so operational sequences are not linear procedures (García Rosselló & Calvo Trias 2013; Roux 2016).

Clay procurement and preparation practices

To begin with, people collect clays together with rocks, sand, bark, wood, grass, and water to make things destined to store, cook, ornament, produce sound, weave fabrics, polish other things, etc. We will refer to this stage of the process as procurement practices, in which humans walk, navigate, collect, and transport certain things. Acquiring the materials can be done on the surface, through excavations, or on the beds of rivers, streams, and creeks. Even though initially it was thought that raw material procurement was guided mostly by certain proximity economic reasons (Arnold 1985), extensive ethnoarchaeological work has established that it is more related to habitual practices than previously thought (Gosselain & Livingstone Smith 2005).

Then, clay preparation practices are divided in two different groups. The first one concerns the modification of the argillaceous materials, which includes the fragmentation, sorting granularity (either dry or wet), hydration, withdrawal of inclusions, addition of temper, or mixing of clays. Second, the homogenization of the paste comprises kneading, mixing, and maturation. Then, paste recipe preparation is a process that involves the removal and addition of materials within the clay paste to configure a particular clay/inclusion/water compound. Fragmentation aims to reduce the clay mass to homogenous structural entities with similar hydration capabilities; the clay recipe is usually dried, then crushed and pulverized. Sorting usually involves the removal of certain particles, such as naturally occurring coarser inclusions, organic matter, and minerals that can affect the pots during firing like calcite or mica, among other "impurities". The withdrawing of these materials may include drying, crushing, grinding, winnowing and can be undertaken: by hand (usually wet clay), which involves manipulating the clay and detecting with the fingers the unwanted elements; by dry sieving, with the employment of organic and inorganic sieves; by liquid sieving (also called settling), which entails levigation or simple soaking and stirring techniques (Rye 1981; Shepard 1985; Sinopoli 1991; Rice 2005; Orton & Hughes 2013; Roux 2016).

Temper can also be referred to as inclusions, aplastics, non-plastics, additives, modifiers, fillers, aggregates, etc. They consist of geological, organic, and/or cultural particles which are added to the clay in order to improve workability, to achieve certain effects in the end product, or just because it is habitual. Also, tempers can be added as a byproduct of the manufacturing process, meaning by accidental addition related to working surfaces or tools (Rice 2005). In general, purposefully-added tempers can then be divided into two main groups, depending on the desired effect (Roux 2016): a) to adjust plasticity for shaping and drying, plastic agents are added to rigid clays and vice versa; b) to regulate mechanical and thermal shock (for example, increasing pore volume makes the pot more resistant to mechanical stress, as well as fast temperature changes, improving heating transfer, water percolation, and evaporation) (Sinopoli 1991; Rice 2005; Orton & Hughes 2013; Roux 2016). Also, adding temper reduces shrinkage (Jacobs 1983; Shepard 1985). Additionally, sometimes different clays with complementary properties are combined. For example, a clay that is too sticky but has good plasticity may be mixed with one that is less plastic but not sticky, for example. Also, a widely available clay can be mixed with a less accessible one (Shepard 1985; Roux 2016).

The homogenization of the clay involves its systematic manipulation to discard air pockets and clay lumps; to homogenize the distribution of inclusions and water content; and to increase the clay's workability (Rice 2005). There are many ways to process the clay recipe, and they can be complementary rather than mutually exclusive. Wedging consists of slicing wet clay with a fine wire several times and remixing the segments or slamming clay onto a smooth hard surface (Rice 2005). Hand kneading applies bodily gestures similar to the ones used when processing edible doughs. Pestle kneading has the same effect as hand kneading but uses a *mano* instead of human hands. Foot treading is usually employed in the case of larger scale production, when pressure is applied with the heels for faster processing or larger amounts of clay. Wedging, kneading and treading aid in the homogeneous incorporation of non-plastic particles, water content, elimination of voids and minimization of pores. Maturing consists of storing wet clay

material to accelerate enzyme production, which optimizes hydration and plasticity (Roux 2016).

Fashioning

Fashioning involves different methods, techniques, procedures, gestures, and tools. A method is defined as "(...) an ordered sequence of functional operations executed through a set of elementary gestures that can be performed using different techniques" (Roux 2016, 63). A technique is characterized as "(...) a series of physical modalities according to which raw materials are transformed" (Roux 2016, 64). Phases describe the different fashioning techniques applied to the various parts of the vessel. To achieve the end product, there are two successive stages: first, the rough-out, when the "hollow volume" does not feature the final geometric characteristics, and then the pre-forming, which takes place when after those properties have already been achieved. For each technique, we will follow Roux (2016) on her division according to the source of energy (muscular or no rotary kinetic energy opposed to rotary kinetic energy). Also, we will split them according to the two types of forces applied: pressure and percussion. Regarding the hydration state of clay, I will refer to wet clay when it is plastic and to leather hard clay when, after drying, the clay still conserves the ability to be deformed. Additionally, when referring to tools, we make the basic distinction between active, passive, and rotative tools. Active tools consist of those held by potters with their hands, and they are subdivided into pressure tools, applied on wet clay, and percussion tools, usually employed on wet clay but sometimes also on leather hard clay. Flat surfaces, supports and molds would be examples of passive tools; whereas rotative devices (the tournette and the wheel) allow potters to continuously rotate vessels (Roux 2016).[52]

Roughing out can be done either from a mass of clay or from assembled elements: coils, which imply pressure and then pinching, crushing, and/or drawing; or slabs using percussion. In order to perform these tasks, it is necessary to use tools, which are divided into active (hands, scraper), passive (supports, concave molds), or instruments (rotative devices). Coils and slabs can be combined during the formation of one vessel; for example, a circular slab can be used for the base, while the body of the vessel might be coiled. Additionally, the different elements can be "glued" with *barbotine*, a clay solution. These operations of attaching multiple components, whether or not they involve *barbotine*, are referred to as assemblage according to García Roselló and Calvo Trias (2013, 53). When roughing out is done from a mass of clay, it is classified as modeling when pressure is applied through pinching and drawing, so the only tools employed are the hands and fingers. Molding or hammering, by contrast, are characterized by the use of percussion as the main force. In the case of hammering on wet clay, hands, fingers, and other active tools can be employed, while mats or anvils can be used as support. In turn, molding uses hands, percutors, and rolls as active tools, as well as molds (concave, convex, horizontal, vertical, mobile, fixed, with or without handles) (Roux 2016).

Pre-forming can be done in seven different ways, depending if the clay is wet or in a leather hard hygronomic state. If wet, it can be performed by pressure either through scraping or discontinuous pressure, or by percussion through beating. When the clay is leather hard, it can be worked with pressure through *repoussage*, which implies pushing against the internal wall of the vessel applying a vertical movement to thin and curve the walls, using a hand to support the external wall and a tool to perform the pushing gesture. A second technique that applies pressure in a leather hard clay state is shaving, which uses a sharp active tool and a mandrel or some similar surface as a passive tool. Additionally, two techniques can be applied on this same hygronomic state. First, paddling, which consists of applying force through a tool perpendicular to the external walls of the vessel or the base; and second, *martelage*, which involves similar gestures to paddling, but with the difference that percussion force is applied to the internal walls of the vessels, or their base. The main difference between paddling and *martelage* is that the second technique does not require the use of a "counter-beater" (Roux 2016).

Finishing

Finishing operations are executed after fashioning and before surface treatment or decoration, and they consist of the modification of the superficial layer of the paste for its homogenization (Roux 2016, 125). Three different techniques have been characterized: wet clay smoothing, which is based on pressure that

52 Since my dataset lacks vessels fashioned with rotative devices (see Chapter 7), I will not define or describe the techniques related to them. For a thorough overview, see Roux (2016, 101-124).

can be either discontinuous or continuous (when a rotative support is used) with the application of active tools; *brossage*, which consists of rubbing the paste with a hard re-hydrated tool, in order to homogenize the surface of the vessel; and leather hard clay smoothing, which is similar to the latter but with the application of a flexible tool (Roux 2016).

Surface treatment
The different treatments of the surface of the vessels imply the transformation of the external layer of the recipients, performed after finishing operations. There are two main divisions within surface treatments: those techniques that involve friction and those that consist of coating. Once the vessel is either in a leather hard clay state or dry, it can be subjected to friction in order to create a compact external layer. *Doucissage* consists of friction gestures applied with a rigid tool that is constantly re-hydrated, while burnishing is when rubbing is done on leather hard clay or dry clay with a hard tool without the addition of water. Polishing is similar to burnishing but is performed with a flexible tool (Roux 2016). Coating can imply the addition of more or less liquid argillaceous materials (*barbotine*, *crepissage*, *engobe*); the application of coatings made of organic materials, including graphite; or glazing, which implies the application of a layer of vitreous materials fused with the ceramics at high temperatures that are rapidly cooled for retaining some of their liquid characteristics (Rye 1981, 98). Finally, smoking consists of exposition to fire in order to achieve a black or gray surface color that can also aid in impermeabilization (Roux 2016).

Decoration
Decorative techniques have ornamental purposes but are sometimes also functional and comprise painting—which can be negative—impressions (punctuated impression, impression *basculée*, rolled impression, stamping, impression by beating), incisions (punctuation, rotative, scraping, and engraving), excisions, application of elements (appliqués), and modelled decorations (Roux 2016).

Drying
Progressive drying is important to avoid cracks, fissures, and collapse during firing. Its duration is variable, depending on the climate of the place of production (Roux 2016).

Firing
During firing, vessels acquire irreversible physicochemical properties; temperature, duration, heating speed, and atmosphere extremely affect the results. Roux distinguishes two main types of firing techniques: those in which the vessels are in direct contact with the fuel and other recipients and those in which there is no contact with the fuel (Roux 2016, 151). Within the first group, she includes open firing and furnaces; the second group encompasses firing structures that have a combustion chamber separated from another chamber where the vessels are positioned (Roux 2016).
Post-firing techniques involving the application of organic materials while the pot is still hot, such as coal tar, calcite washes (also done before firing), or tree resins, can be performed in order to improve the vessel's appearance, decrease permeability, and possibly increase strength (Rye 1981).
The description of these many possibilities within the process of ceramic manufacture leads us to question the mechanisms through which potters, and more precisely, groups of potters "choose" from the different available steps. And the question of the availability of these steps is crucial; can potters really choose from all of these variables? What mechanisms operate in this "selection" process? How does this universe of what is possible unfold?

3.4 TOWARDS VIBRANT CHRONOLOGIES

The histories of the different trajectories of what is possible, of what is habitual, are histories of power, of the incorporation of social structure in our physical body, leaving traces in our bones, which in turn leave traces in what we make. The palimpsestic ontology of materiality (body, bone, vessel, architecture, for example) goes beyond Cartesian dichotomies; materiality is the bundling of unfolding traces. Therefore, archaeological narratives can no longer rely on only two variables: time-space and pottery styles. A single itinerary (pottery) does not and cannot account for the whole picture, and indeed there is no single big picture, because every time we zoom out, more bundles appear. And this kind of complexity does not necessarily imply the impossibility of generating knowledge; it just makes us aware of the reductionisms, which are not only

temporal, that are present within the archaeological paradigm of chronologies.

I look outside my window, and I see the Van Steenis building at the Faculty of Archaeology, in Leiden University, The Netherlands. I see what looks like iron structures painted in a grayish blue, I see glass, I see trees, and I see a lot of bricks painted white. On blue sky days, the glasses reflect bright colors; on cloudy days like today, the glasses look more gloomy. On rainy days, the drops distract me from my writing with the noise they make when they bump into my window. It is autumn, so the beautiful tree in the backyard is starting to lose its green color, and its leaves are turning yellow. When I go downtown, my universe is different; it turns into a reddish brown world, due to the unpainted iron-rich bricks commonly employed in construction; it is ovally criss-crossed by water canals, trees, flowers, bridges, seagulls, ducks, gangs of angry swans who monopolize the looting of public trash cans, bicycles, murderous buses, the song that the clock at the City Hall building sings every hour or so, the smell of fried food, people, shops, houses, etc. Chronological narratives should include these kinds of descriptive exercises; the archaeological record is rich in multiple palimpsests of the constantly unfolding worlds of materials, and we should take up the imaginative challenge to narrate it.

I therefore conceive archaeological chronologies as the *vital* and *vibrant* bundling of the different itineraries of practices, viewed beyond "(...) the onto-theological binaries of life/matter, human/animal, will/determination, and organic/inorganic" (Bennett 2010, X). In our case study, the valley of Juigalpa, these practices entail, for instance, mound construction, ceramic and lithic artifact manufacture, foodways, participation in constellations and networks of practices, spatial configurations within sites, etc. Each variable has its own history intertwined with the histories of other variables. Chronology does not equal the study of variation, but rather how the trajectories of each practice interweave through time-space. And each variable in of itself is formed by multiple trajectories of other itineraries. There are no phases, periods, or horizons, but rather processes. Even our valley is processual; it is not our starting *point*, it is the unfolding of geological, geochemical, atmospheric, seasonal, and numerous other processes that allow us to make an abstraction such as the valley of Juigalpa as a time-space "unit". And what we look at is actually its unfolding, its becoming, not a frozen picture taken at a certain moment, because the profiles of our own archaeological excavations are also processual. Chronologies are animated, they should be narratives of everyday experiences, full of *life*, power, and conflict, and not descriptions of the formal aspects of pots. I want to read about how the biographies of those vessels connect with the biographies of other things. I want to read a chronology and think of the person who made that plate, of what was eaten on it, what plants and animals were grown, harvested, collected, and hunted to produce such meals; if people prefered boiling, steaming, or roasting; if everyone ate from small individual containers or whether there were bigger communal dishes; if rains were heavier or the weather was drier than today; if volcanic eruptions were part of the universe of possibilities; I want to know where I found that plate fragment and why. I want to know what the world where it was produced and/or used looked like.

Back within our valley of Juigalpa, let's take our first example, mound construction, and let's assume that these structures were foundations of something similar to what nowadays we know as a house in Western culture. The practice of finding and modifying shelter, of using stuff to build things, the bodily gestures of digging and erecting structures is hardly unique to humans; every landscape is a symphony of different species and their homes. For humans, this practice does not directly imply sedentarism or agriculture (Flannery 1972; 1995; Bender 1978); in our example it only suggests the employment of non-perishable materials that allows us to account for ancient architectural efforts. Previous earthen mounds might have been constructed, but winds, rain, and erosion made sure they are not observable to us anymore. Therefore, we can state that there was indeed an intention to build, and that this intention was not necessarily new, but the innovation resided in the use of a combination of rock and sediment that we can still see today. The use of rock implied specific knowledge of the landscape and a particular relationship with it, which also applies to the use of sediment for construction purposes, that entailed the practice of mixing several types of soils for making foundations. Wood, clays, rocks, leaves, ash, fire, and rope are only some of the possible "ingredients" selected. We can also infer that mound builders knew that these foundations were more resistant to human and non-human actants (Latour 2005, 54) because this is something

easily observable after the first harsh rainy season in a mound's biography. Therefore, I do not interpret the perennial characteristic of these structures as an unintended consequence. However, the houses built on top of these stable and durable foundations were constantly threatened by several enemies, including not only water but also vermin, for example. It is time now to stop for a second and think about this division that I just made between foundation and house. Even though it is somewhat arbitrary, the maintenance of wattle-and-daub walls and thatched roofs is indeed much more demanding than that of a base made of quarried bedrock fragments mixed with clay. Also, foundations can be used as surfaces for several different structures, and one foundation can "host" various houses through time. Building several structures also accounts for some sort of sense of community, of the intention of living together, of sharing a space but also of compartmentalizing it.

Mound practices entangle many more processes like the few described above. Like ceramic manufacture, building also requires certain steps to follow in order to accomplish the desired product. All habitual practices have their own situated ways of doing. Therefore, chronological narratives include genealogies of practices (Pauketat & Alt 2005; Gosselain 2018), the microhistories of several interconnected subvariables that bundle together these different practices. And my account of the trajectories of mound construction techniques and morphologies, of "village" layouts, is only the tip of the iceberg of the experiences of people who lived in a world of clay structures, who also looked through their "windows", but saw something completely different to my brief description of the view from my window at the Faculty of Archaeology at Leiden University. And that is exactly what I want to accomplish with my vital and vibrant chronologies.