

Archaeology + Ethnobotany = Palaeoethnobotany ?

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Summary

The archaeobotanical analysis in the Central and Northern Andes, which developments are recent, turn often to ethnographical and historical models for interpreting archaeological data. This poorly controlled comparisons, frequently lead to unverifiable, or even unacceptable, palaeoethnobotanical hypotheses. On which basis then, may we interpret archaeobotanical data ? Moreover, is there any way it can be done in Andean Americas ? We will take the site of Pampa Chica (Lurín, Peru) an example of this, and try to outline future investigations in that topic.

Introduction

I became interested in the use of ethnographical models for the interpretation of archaeological remains, whilst conducting analyses of archaeobotanical remains in the context of a research project in the Lurín valley, in the Peruvian Central coast (Fig. 1).

In fact, I had been commissioned to conduct the archaeobotanical analyses of the macroremains of the Pampa Chica site (Fig. 2). While going through the determinations, it quickly became apparent that there was a hiatus between the preliminary functional interpretations of certain parts of the site and my botanical identifications. More precisely, this was the case for sector 2 recinto 22 (Fig. 3), which had been determined as a place for the production of maize beer or chicha because of the shape and size of the ceramics and the fact that there were maize remains.

In light of the totality of archaeological remains, this hypothesis seemed somewhat exaggerated. In fact, it was based on a holistic approach that made inferences about technical and economical processes of chicha production, as well as inferences about complex social and political relations.

The aim of this paper is not to criticize the behavior of a particular archaeologist, since my role as archaeobotanist is to help the archaeologist interpret his site and its history, but rather to question the use of certain heuristic models that may lead to abusive interpretations of archaeological facts.

I will start by reviewing available data on maize from Peru, and critically evaluate the role of maize in Andean archaeology. Secondly, I will present the models used for interpreting maize remains and

discuss the references used for the case of Pampa Chica. Finally, I will present my own botanical analyses for Pampa Chica.

Archaeological data

Before discussing problems associated with the use of ethnographic ideologies, or with the application of models for interpreting archaeological remains, we would like to question the value that gets attributed to remains: not only the «scientific» value ¹, but also the «emotional» value ². In fact, there is greater pressure for interpretation of remains that have both a scientific and/or an emotional value, than for remains that lack «meaning». Even though this attitude is human, it often leads a less rigorous interpretation. It should be noted that more often than not, the emotional value leads to an overestimation of the scientific value of remains.

Consider the value of maize (*Zea mays* L.) in Peru. Although its' real scientific value depends on the archaeological context and the research problem of the site, its' emotional value is always very high varying from: «need to take into account, but not a determinant» to «gives new and startling information capable of changing our vision of the past». Consequently, the perception of maize and its' domestication, production and consumption in pre-Columbian world is generally overestimated.

In fact, valid archaeobotanical data have shown that maize (*Zea mays* L.) appeared quite late in Peru, and that it remained secondary for a long time in pre-Columbian Peruvian economies. (CHEVALIER 1993, 1999; PEARSALL 1992, 1994a, 1994b, 1995; PEARSALL & PIPERNO 1990, PIPERNO 1991; PIPERNO & PEARSALL 1998). Although several occurrences ³ are reported for the Preceramic period (prior to ~2200 BC), their validity is undermined by problems of datation and

¹ Or: pertinence of information given by the remain as a function of the research problem.

² Under this term we include all non scientific aspects – ideological, political, or even social that are linked and influence archaeology.

³ Sites of Aspero, Culebras, Las Aldas, and Los Gavilanes in the north coast, Pikimachay and Guitarrero in the central Andes.

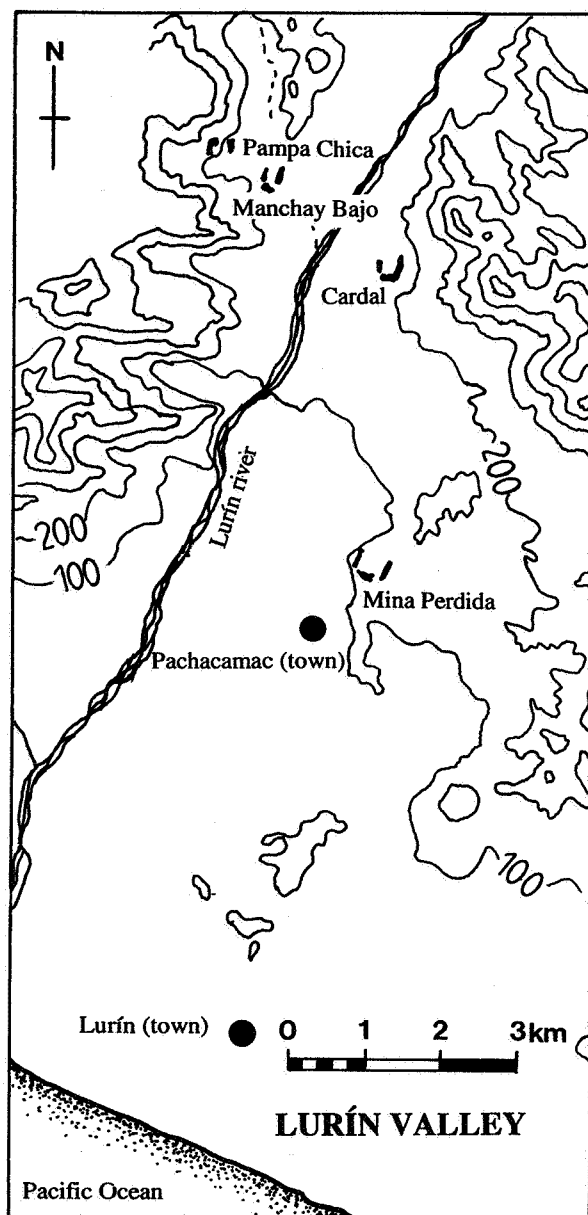


Figure 1: Map of the Lurín Valley, Central coast of Perú.

contextualization⁴. First reliable evidence goes back to the initial period only (~2200 to ~1400 BC) with the sites of La Galgada (GRIEDER *et al.* 1988), Mina Perdida (CHEVALIER, nd), Cardal (BURGER 1987; CHEVALIER, nd; UMLAUF 1988, 1993) or Pampa Rosario (POZORSKI & POZORSKI 1987), increasing at the Early Horizon (~1400 to ~100 BC).

In addition, it should be noted that not all sites have maize (PEARSALL 1992: 192), that the minimum number of individuals is very low, and the dimensions of the grains and the cob are still quite small. During the Early Intermediate Period (~100 BC to ~700 AD), maize is reported for all the sites of that period, and it had become more important in size



Figure 2: Site of Pampa Chica, structure 1, and Lurín valley in the background.

and quantity. Although in the absence of systematic analyses it is difficult to know what role maize played in the diet, it is probable that towards the end of this period (from 600 AD), maize represented at least in the north coast «the principal component of daily diet» (CÁRDENAS *et al.* 1997: 148). Whatever the implications of Cardenas' affirmation, what we can say is that maize is an essential part of the ideology and of political groups in the early intermediate period if you consider the numerous representations of maize in ceramics by the Mochicas (EUBANK DUNN 1979) or the textiles and ceramics, as well as the accompanying materials by the Nazca (PAUL 1986, 1990; PROULX 1968). From the Middle Horizon period (about 700 AD) we can consider that maize is an important food in the coast and in the Andean valleys. This phenomenon may be related to the apparition and expansion of the Wari as suggested by Katharina SCHREIBER (1991). From then on, maize constituted a staple food, or at least played a central role in agromonic politics and in the Inca ideology (HASTORF 1990, 1993; HASTORF & EARLE 1985; MORRIS 1979, 1985; MORRIS & THOMPSON 1985; ROSTWOROWSKI DE DIEZ CANSECO 1967-68, 1977, 1989).

⁴ Los Gavilanes dates back to 2890-2480 BC (Epoca 2: GX-5076, 4140 ±160 BP. Calibration conducted for 1s, 68.2% of confidence, STUIVER & KRA 1993) (STUIVER *et al.* 1993), with Oxcal 3b2 (BONAVIA 1982; GROBMAN 1982; POPPER 1982), but highly debated (McK BIRD 1978, 1990; PEARSALL 1992) because the direct datation of maize obtained was actually between «200 et 600 BC non calibrated» (BONAVIA 1982, 73). Only three maize cobs from Apsero could come from undisturbed pre-ceramic contexts (As1V-4=5 et As1D-1=2), but the specimens are found each tiem of the superior layers that have not been directly dates (FELDMAN 1980, 1985). Finally, la Cueva de Guitarrero (LYNCH 1980; LYNCH *et al.* 1985) gives also a very recent date 360 BC to 10 our era (OxA 110 2150 ±150 .Calibration conducted for 1s, 68.2% of confidence, STUIVER & KRA 1993) with Oxcal 3b2.

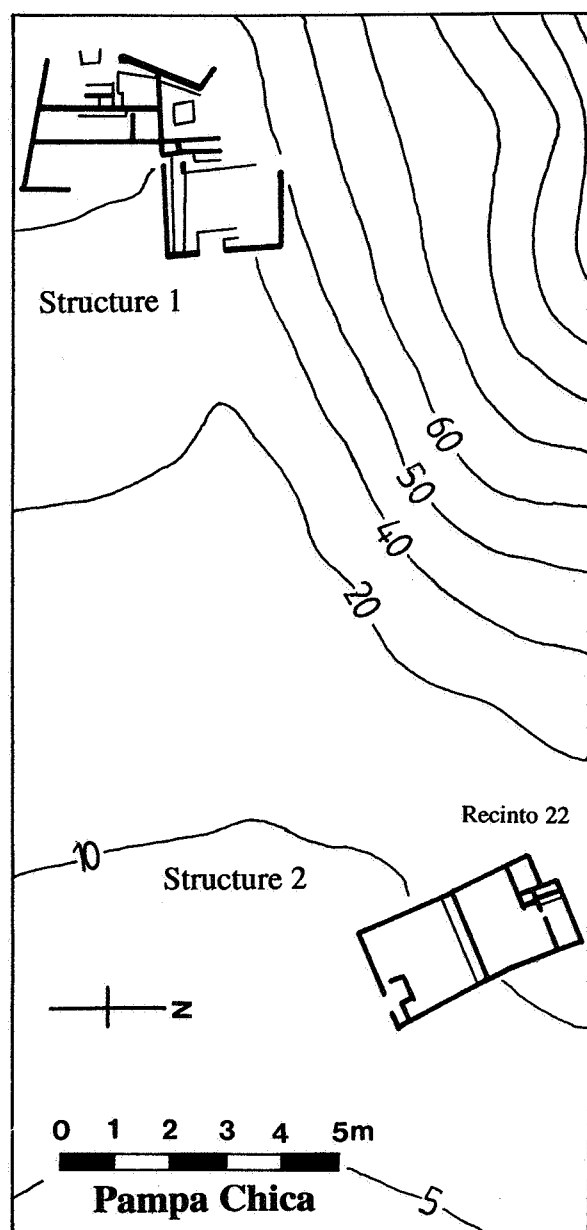


Figure 3: Map of Pampa Chica.

Cultural et political archaeology

Why such an overestimation of the perceived role of maize in the economy and ideology of pre-Inca groups in Peru?

The influence of American archaeology on Peruvian archaeology is probably one of the main reasons. In fact, the interest given to maize is almost an obsession to a lot of North American archaeologists, in particular those that support the anthropological archaeology. For whatever reason (internal consumption? Mesoamerican influence? Need to find the origins?), from the very start of research on the domestication of maize (CUTLER 1946; GALINAT 1954;

MANGELSDORF *et al.* 1967; MANGELSDORF & REEVES 1939), a lot of American archaeologists working in Mesoamerican and Andean countries have shown the same exaggerated interest for maize. Generally, these archaeologists have strained the interpretation of archaeological remains, often failing to adapt their hypothesis to the archaeological facts. Bruce BENZ (1994: 158) asked himself the same question which included a partial answer: «What is it about maize that interest us? I suspect our interest in the cultigen of maize derives in part from a belief that we might be able to reconstruct patterns and processes of cultural evolution and diversification using maize race phylogenies».

Surprisingly, the interest for the past of maize is supported by contemporary research on the genotype of maize to improve the quality genetic crops. In fact, the aim of most genetic research is to find the greatest variety of old and modern maize to be able to re-create the most complete genetic map, and thus be able to exploit it in the creation of new improved varieties. Besides, the manuals we use in archaeology to determine the different archaeological races of maize⁵ have been published by the Agricultural Board of the National Academy of Science whose major aim is to «study and report on scientific problems of agriculture in relation to the national economy»⁶. Therefore, we are no longer in the context of an archaeological research perspective, but in the context of a national economic priority. The goal is not to accumulate knowledge «of the past cultural evolution through the study of maize phylogenies» to paraphrase Benz, but rather to index races for future exploitation of their characteristics when developing new varieties.

In a scientific system that pushes researchers to «sell» their research to guarantee funds for investigation and thus ensure their careers, the temptation to create pseudo-events is big⁷. Specially, is we know that the element in question – maize – is extremely significant for the moral and financial bodies that finance these projects. The race is on to find the oldest father of maize and of its derivatives, chicha, without giving too much consideration to the archaeological realities that we can loose.

Finally, we shouldn't forget the impact that nationalism has on the overestimation of certain archaeological remains. Maize is clearly a national symbol, just as chicha. A good (unfortunate?) example of the impact of nationalism on archeology is the insistence of certain Peruvian archaeologists to consider Peru as one of the oldest centers of diversification, together with Mexico, or further still as a center of domestication of maize (BONAVIA 1982; BONAVIA &

⁵ The identification of vegetal archaeological remains is conducted by using contemporary analogies, in fact, we should be talking about the probability of accurate identification.

⁶ Covers page of these books, for example: (GROBMAN *et al.* 1961).

⁷ The common scientific saying «publish or perish» is quite representative of this situation.

GROBMAN 1989a, 1989b). These claims are made despite the archaeological evidence (or lack of evidence) from Central and South America (PEARSALL 1978, 1992, 1995; PEARSALL & PIPERNO 1990; PIPERNO & PEARSALL 1998).

If we were to accept these claims, chicha would have been produced from the beginning with wild maize! Peruvian maize beer would be just as old as Egyptian beer. Of course, if it isn't European beer that is the oldest, or Spanish or German...

As argued by Daniel MARGUERAT «Let us not forget that the past [is explored] with the aim of reconstituting a memory for the present» (*Le Temps*, Geneva, December 3, 1999). Thus we need to remember to be cautious we re-reading events that are reconstituted by archaeologists.

Ethnocomparison and analogies: justifications and interpretations

The past is often used in a curious way. Going back to the issue of the production of maize beer, it would seem that the use of historical analogies automatically validates the interpretation of archaeological facts. In any case, it is given more theoretical validity than the use of contemporary ethnographic examples.

In this way the importance of maize for the Incas is attributed to other pre-Inca cultures without any archaeobotanical data to support this vision. If we follow and distort a little bit Gould's model of continuity⁸ (GOULD 1974): if something occurred during the Incas, it must have occurred before; and if it occurred before, it also must have occurred before that. Thus, the past is perceived as immutable, some sort of mystical time where linear or circular time did not exist. From this point of view, it is irrelevant to question of the validity of an example: if it's from the past it's accurate. The common expression of «and probably before that...» reflects this attitude⁹. Once this said, we enter the mystical past, immemorial, where everything always existed from the moment teeth were planted and maize first bloomed¹⁰.

This notion is reinforced by the cultural rupture introduced by the conquest: there is a before and an after. Whatever precedes 1532 is more valid as an analogy than what follows. The world of pre-Columbian becomes a vast cultural entity, not unlike the conceptualization of the golden age, that was lost after the intrusion of the European world in this American paradise. Little does it matter if this pre-Columbian unity is relative, or if we compare and transpose one anthropological culture with another more recent by 2000 years, or if our knowledge of the recent past is incomplete, finally, little does it matter if archaeological remains are not studied with rigor. After all, we were able to reconstruct our continuous identity if only for one instant.

The use of contemporary ethnographic analogies to interpret archaeological remains is not without risks. Apart from the chronological and cultural distances, there is always a question of knowing if it is legitimate to compare elements of cultures from different stages, in the Stewards sense of the word.

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Figure 4: The harvesting of maize in the Inca times.
[Guaman POMA DE AYALA 1987]

Moreover, it seems that researchers are not comparing the same «elements»: on the one hand we have processes (models), and the other, the remains of these processes. There is always an interpretative overvaluation of archaeological remains, mostly because authors base themselves on data from cultural anthropology (which are factual and complete) to give meaning to archaeological data which is sparse and full of gaps¹¹.

⁸ «Continuous models depend upon situations in which the living, ethnographical society upon which the model is based can be demonstrated to be historically continuous with the prehistoric culture being excavated in the same region.» (GOULD 1978: 255)

⁹ It would be too long to cite here all the references where this expression appears. In fact we can find these expression in practically all archaeological references on maize.

¹⁰ Here we are primarily alluding to the myths of the central Peruvian coast concerning the God of Pachacamac (although there are also several similar Amazonian myths), which refer to the dismembered body of a woman/ child/ divinity (Vichama) whose different parts were once planted on earth and gave birth to the different plants of the Andean world. See for example (OSSIO 1996: 80; ROSTWOROWSKI DE DIEZ CANSECO 1986: 74).

¹¹ By instance ANDERS (1991: 168), CHAPDELAINE *et al.* (1997: 80), ISBELL *et al.* (1991: 43) and many other authors.

DJINDJIAN (1991: 325) goes even further when he writes: «archaeology can only obtain partial and incomplete information, and its cultural reference is shadowed rather than enlightened by local analogies and by ideological or experimental presumptions.» Finally, there is a filling of archaeological gaps, or even worse a replacement of archeological missing data based on contemporary models. As proposed by GOULD (1978: 254) «ethnographic analogies are by no means without value in archaeology, but they suffer from an inherent limitation – they cannot inform us about prehistoric behavior patterns that have no modern counterpart or analogue.»

The analysis of components

My main interest here, is not to track back or add to the polemic of whether to use ethnographic models in archaeology. My intention is rather to highlight the fact that many authors mix up two levels of analysis – ethnocomparison and historical analogy – without much consideration for the coherence of their discourse. Coherence of discourse is also hindered by the fact that most archaeologists do not even evaluate their own archaeological materials. To our knowledge, only MOORE (1989) referred to observations of contemporary remains of the production of chicha to analyze his own archaeological materials. He first created a grid of analysis with the different stages of chicha production, the different materials, and corre-

sponding remains. He then compared his archaeological remains to the contemporary grid of analysis. There are some limitations to his study however: some of the material elements that are associated to chicha production are ambiguous because they can be used for other things. In fact, ethnoarchaeological studies have successfully shown that «the same material can have different functional connotations, and the same function can be obtained through different material dispositions» (GALLAY 1986: 182). Therefore, we need to evaluate each of the elements in terms of their potential ambiguity, and to make estimates of their behavior when combined (Table 1). Any artifact taken individually can be ambiguous (i.e. multifunctional) irrespective of its' location in a site, and thus it cannot provide conclusive evidence of chicha production. In addition, no conclusion can be made about the associations between these artifacts, whatever their arrangement, number of elements, and location. Clearly, a piece of cloth together with a batán and some earth, cannot be taken as proof of chicha production.

Out of all the artifacts, ceramics jars or vessels have systematically been used as proof of chicha production (refer to note 11 for some examples). These claims have been made even though there are no typological analyses of the shapes and dimensions of these ceramics. Even more worrisome, is the fact that these claims continue to be made even though several studies have shown that between the production of a ceramic, its' shape and its' actual

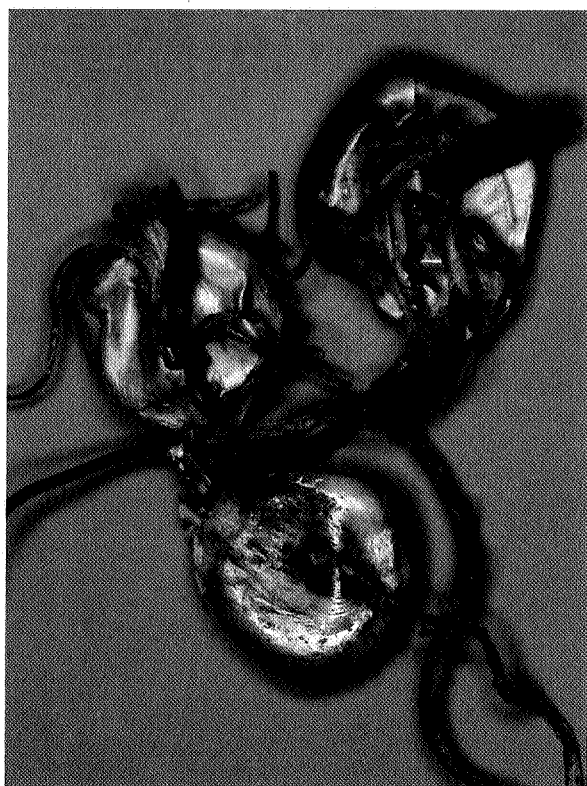


Figure 5: Serving the chicha. Cuzco, SANTURANTIKUY 1998.

Table 1: Steps in chicha-production, adapted by author from (CUTLER & CARDENAS 1947; GILLIN 1947; MOORE 1989; NICHOLSON 1960).

steps	facilities	artifacts	products/byproducts
maize selection			whole ears of same race maize
removal of kernels			maize cobs, cupules & kernels
soaking maize		large jars	
germination	patio area	cloth, matting, leaves	uncharred kernels & <i>jora</i>
drying maize	patio area		<i>jora</i>
grinding		batán/chungo	<i>jora</i> , fragmented dry kernels
cooking	hearth	fire-reddened vessel, stirring implement	charcoal, ashes,
decantation & straining		cloth, basketry sieves	<i>alfrecho</i> , skins
fermentation		large vessels	starch grains & yeast
consumption		mate or ceramic bowls	starch grains & yeast

use there are several functional and semantic modifications (LUMBRERAS 1987: 31). Moreover, ceramics of similar shape, or even the same ceramic may have different uses as a function of the cultural group and the person using it (CEUNINCK 1994; LEROI-GOURHAN 1971; SABOGAL WIESSE 1982: 117, 127). The only supra-functions that may be accurately inferred are – recipients for cooking, to preserve food, transportation, etc – but in no case can we make accurate inferences about complex functions such as chicha production (CEUNINCK 1994).

Figure 6: *Jora*, germinated dried maize.

A more promising source of information about chicha production may be obtained by analyzing the potential byproducts, and the association of artifacts with these byproducts. Indeed, these elements may offer more direct evidence of the elaboration of chicha, particularly when there is evidence of maize. However, researchers need to be cautious when interpreting remains such as non carbonized maize grains, cobs or cupule fragments. These remains are ambiguous as they may indicate another type of preparation (irrespective of the type of ceramic with which they are associated). In contrast, there is a greater probability that the presence of *jora* (germinated grain) indicates the production of chicha. We emphasize «greater probability» because depending of the context and the number of items found, the germination of grains could also be accidental. However, if the *jora* is directly associated with *batán* (for grinding), or if they are found scattered in a small space (germination surface), then the *jora* may be used as a direct indicator of chicha production.

The same principle applies for the interpretation of yeast grains. Starch grains found in a *batán* or in a ceramic are not evidence of chicha production but of grinding. Even when associated with yeast, there is always a possibility that the fermentation is simply the result of stockade of grains, as opposed to the result of human control and manipulation. Even where there is a very high probability that these elements are indicating chicha production, we should interpret remains with caution.

The only irrefutable element in the production of chicha is *alfrecho*: a germinated grain, that has been ground and cooked, and mixed together with loose grains' skin. Unfortunately it is not very simple to identify *alfrecho* in a site. To our knowledge, Nicholson is alone in having identified *alfrecho* remains in the site of Manchán. It is highly likely that *alfrecho* was used to feed animals (llamas, guinea pig), or as combustible once dry, or simply biologically degraded (as opposed to conserved in a pit). Only in-depth analyses of *alfrecho* and its' transformations (e.g. carbonization, remains in the animal gastric tube, etc.) would allow its' identification in other contexts. To date, this type of analysis has

never been conducted. We have seen that the value of archaeological remains varies for different hypotheses. The value we give to archaeological remains must be taken into account before interpretation: unfortunately this is rarely the case.

The interpretative phylum of Pampa Chica

To illustrate some of the over-interpretation problems raised in this article we will track back the interpretative phylum that lead to Pampa Chica. The authors (DULANTO *et al.* in press) proposed a zone for the production of chicha based on: the particularity of the material (big bowls forming big jars, and maize fragments) and the association of the contexts (wholes that had the size of the jars, and of the hearths) while taking into account their disposition in space and their association to material remains. The authors support their claim by citing an archaeological example (SHIMADA 1994b) and an ethnographical example (CAMINO 1987) which are far from being coherent. In fact, the archaeological example clearly depends on other interpretations. In addition, the ethnographical example focussed on technical and social relations rather than on the analysis of remains. The limits of ethnocomparison have been already discussed, so I will not elaborate more at this point. However, I will concentrate here on the use of archaeological examples.

In the beginning of his book, SHIMADA (1994b: 144) mentions the possible production of chicha for sectors D & H. We have no information whatsoever about the material remains on which he bases his hypothesis¹². Further into his writings (*ibid*: 169), he restates the hypothesis of chicha production for sector H, in particular for complex 38 and one room R 8, in which several jars and hearths were found. Reading further on, we are told that «with the exception of the concentration of [...] maize kernels and beans found in formal storage cells in sectors D and H, the overall quantity of recovered remains was quite small. Rather, plants remains were widely found in loose architecture fill» (*ibid*: 182), and that «most of the cob were burnt» (*ibid*: 185, fig. 8.2), but that «cobs, while found in areas of food preparation and consumption, were not recovered from these chicha-making areas» (*ibid*: 190).

From this information, it can be deduced that Shimada based the hypothesis for chicha production on four parameters: 1) large vessels associated with 2) hearths and 3) uncharred 4) kernels, with a particular insistence on two elements – large vessels and maize. Shimada refers to ethnographical (CAMINO 1987; GILLIN 1947; NICHOLSON 1960), archaeological (MOORE 1989; SHIMADA 1976), ethnoarchaeological (SHIMADA 1994a) and ethnohistorical (COBO 1964; MOORE 1989; MORRIS 1974, 1979, 1986) references to choose and interpret these parameters, which could be considered as a very broad and valid corpus.

Unfortunately, as previously discussed, it is problematic to use ethnographic analogies because they are at a different level of analysis than archaeological data. Historical (ethnohistorical) analogies are problematic too, since they don't respect the model

of continuity (see below). Surprisingly, SHIMADA (1994b: 273, note 141) acknowledges himself that «recent studies have shown that the model of Inca redistributive economy [in which the chicha plays a very important role] requires some major revisions [...]. Certainly the Inca economy was undergoing a significant transformation at the time of the Spanish Conquest, including the non-taxpaying sector and the rise of individual ownership.» Even when acknowledging the limitation of his historical references, he refers to them abundantly. The use of ethnoarchaeology is also very surprising, because the mentioned work analyzes the production of ceramics but not their use¹³. Finally, when we look at the archaeological references which should be by far the most interesting: Shimada's Pampa Grande material descriptions differs completely from Moore's Manchán descriptions of vegetal remains¹⁴. As discussed below, each archaeological parameter has a specific value, and some elements (i.e. large vessels, kernels, and earth) are ambiguous and cannot be put forth as proof of chicha production¹⁵. Curiously enough, Shimada refers to Moore's work for interpreting the social and religious roles within the Chimú Kingdom (as an historical analogy), but he completely ignores the archaeological implications.

Fortunately, Shimada's phylum of interpretation stops with Moore's (1989) study, who is quite precise and who does not refer back to any other archaeological examples to interpret his remains. However, we should keep in mind all the other studies with infinite number of interpretative phylum running around in spirals (everybody cites each other, respecting chronological order of the publication of data), or even in a crossed manner for more contemporary articles. If we were to discuss here the economic and social implications of chicha production – which is beyond the scope of this article – we certainly would go back even farther into other spiral and crossed interpretative phylum.

¹² In fact there is no archaeobotanical study presented, and there are no quantitative tables.

¹³ In his ethnoarchaeological analysis Shimada gives an indication of the supra-functionality of these ceramics. In contrast, in his book about Pampa Grande he mentions the utilization of these ceramics for chicha production which we have seen cannot be determined.

¹⁴ Otherwise, Shimada's self-citations are just repetitions of the same approximate facts and interpretations.

¹⁵ To these interpretations problems we should add the numerous contradictions in the text (to cite an example: carbonized maize becomes an indication of chicha production in p. 222, when it wasn't one before that). Thus the systematic use of circular reasoning where references become the cause, for example p. 184 «this relative abundance [of maize] was expected considering the importance of maize as food and as the main ingredient for chicha», or p. 221 «below, we see that at least some of the importance the Inca and the Chimú attached to chicha dates back to Moche V times», or further still «their basic shape [...] may have [...] been inspired by cut gourds bowls that are still used today in rural communities on the North Coast to serve chicha.» (*ibid*: 194)

Archaeobotanical evidence at Pampa Chica

In light of the previous discussion, what affirmations can we make about the production of maize chicha at Pampa Chica? As stated in the introduction, nothing in the analyses allow us to affirm that there was a production of chicha in Pampa Chica. In this section, I present the results of archaeobotanical analyses conducted with 251 flotations of archaeological sediments¹⁶, and 178 botanical samples obtained during the excavation.

We could not identify non-ambiguous remains (as previously defined) such as alfresco or germinated grains of maize jora at Pampa Chica. In fact, we only have ambiguous remains: charred maize kernels, uncharred maize cobs, big jars half-sunken in pits, and numerous hearths in structure 2 (recinto 22). However, several analyses allow us to get around the ambiguity of these remains.

First, the spatial distribution of the macro-remains shows that structure 2, all periods confounded, contains 70% of the total macro-remains found. If we create big categories to classify these botanical remains, actual and presumed use, we notice that structure 2 contains 67% of edible plants, 80% of charred wood, 88% of the plants used for industrial & construction purposes, and about 50% of the



Figure 7: Flotation device used for the Pampa Chica soil samples.

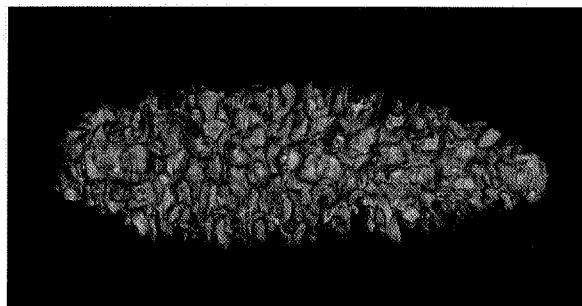


Figure 8 Archaeological uncharred cob from Pampa Chica. (specimen #158)

epidermis (peels) and floral parts. In contrast, structure 1 contains 70% of wild plants, which usage is not known (pharmaceutical?, present in animal feces and used as combustible?, contamination?, carried by feet?), as well as 80% of non determined plants (lack of reference for their identification, or too fragmented to allow identification). Interestingly, structure 2 contains the majority of domestic vegetal remains, as well as most of fruit trees species and wood charcoals¹⁷; and structure 1, contains the majority of wild plants which are not known to be necessarily edible, as well as the 80% of the unknown specimens¹⁸.

Clearly there are different activities in these two sectors, sector 2 could be a place for conservation, transformation and preparation of vegetal foods. Thus, maize is found mostly in sector 2: 93% of the grains and 67% for maize cobs and/or cupules. This could be a first indicator of the production of chicha, but as already discussed these remains are ambiguous as they may also have been consumed or used in another way.

The quality of the remains can also give some indication as to how maize was used. In this case, we only have carbonized grains and cobs or non-carbonized fragments of cobs (cupules). Grains are mostly found in sector 2 (around 91% against 9% in sector 1). These grains would seem non-germinated, although this is hard to ascertain because the carbonization can lead to big deformations and the germ is a very delicate part that can easily break once carbonized. Moreover, it seems that these grains were not ground before carbonization, but once again we cannot ascertain this. In any case, a whole or broken grain can result from multiple preparations that have nothing to do with chicha preparation. Cobs and cob fragments (cupules) are mostly found in sector 2, but in a different proportion than grains (72% for sector 2 against

¹⁶ All the samples have an equal volume of 3 liters.

¹⁷ The importance of «industrial» plants in sector 2 could indicate the presence of a roof to protect these activities, or any other activity.

¹⁸ Problems of modern references for their identification, or samples too fragmented to allow their identification.

Figure 9: Repartition of botanical macroremains in Pampa Chica by use.

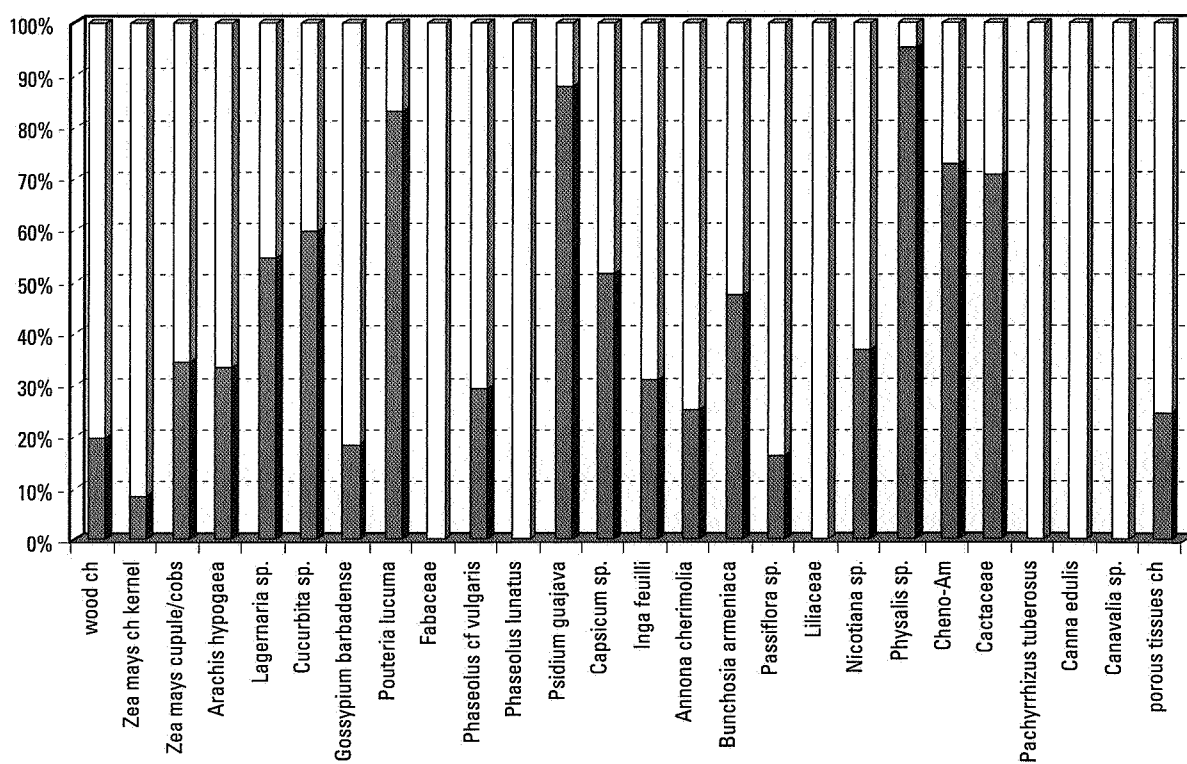
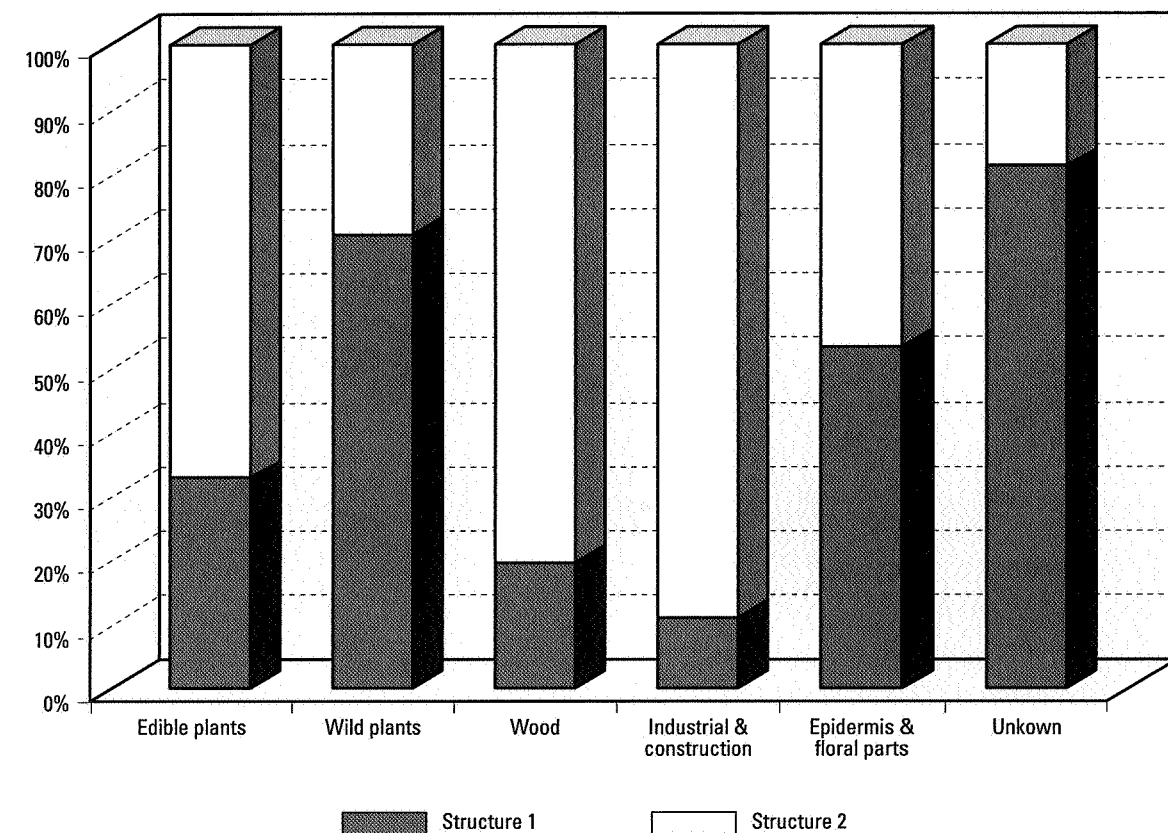


Figure 10: Repartition of the edible botanical macroremains in Pampa Chica.

28% for sector 1). This may indicate a different consumption in these two sectors: a greater picking off grains in sector 2, which could be an indicator of chicha production, and a consumption of whole maize (with cob) in sector 1. However, the greater presence of maize cobs and cupules in sector 1 is due to a higher fragmentation than in sector 2: in fact 63% of whole cobs are found in this latter sector.

Finally, the analysis of the content of ceramics can give information about their use. Unfortunately, it was not possible to use the corpus of ceramics in sector 2: in fact, most of these ceramics were conscientiously washed after being excavated, and at the time it was impossible to obtain glacial acetic acid to remove materials that may have subsisted in the porosity and infractuousity. Therefore I had to come back to the site of Pampa Chica three years later to obtain a sample of the big jars that may have contained the chicha. Our sample was obtained from the bottoms of 5 non-washed ceramics on which I proceeded to scrape the internal walls with a dentist spatula. The sediments were recovered and observed through an Scanning Electron Microscope. The material was non-concentrated, so I could only recover a small part of the particles that were of interest: the phytoliths and starch grains.

Among the different phytoliths, only one was diagnostic of a Poaceae of the Panicoidae tribe to which maize belongs. The size, which is larger than 15μ may indicate a maize phytolith (PEARSALL 1989). However, we must remain cautious as it is the only one we could observe and it is not in a position that allowed accurate observation and measurement. I was able to observe only one grain of starch, which according to REICHERT (1913) could come from maize, but also from peanuts. There were no observations of yeast. Based on these microscope analyses it becomes very hard to conclude that there was chicha production: the jars may well have contained maize, but in a non-ground and non-fermented state. It should be acknowledged that the small size of the sample also plays a role in this lack of precision. The size of the sample should be increased before any hypothesis about maize chicha production at Pampa Chica is definitely accepted or rejected, and before I can propose an alternative hypothesis about the functionality of sector 2 and about the use of these big jars. For instance, the great presence of peanuts in sector 2 (density of $99.41/m^2$ instead of $7.1/m^2$ for maize) associated to starch of

peanuts in a big jar could suggest, as a working hypothesis, that there was rather a production of chicha de maní, that is peanut beer...

Towards an Andean Ethnoarchaeobotany

Based on these analyses I cannot conclude there is evidence of maize chicha production at the site of Pampa Chica as had been preliminary proposed. In fact, we have no non-ambiguous botanical remains, and the different analyses I conducted – spatial distribution, qualitative and microscope – do not offer any element that could support the production of maize beer, even though the probability is slightly increased. But, from an epistemological point of view: is it correct to affirm an activity based solely on the probability of its existence?

What can be said, is that it is necessary to use extremely precise grids of analysis with unequivocal descriptive elements: the more equivocal elements we consider, the more the ambiguity increases. Unequivocal elements can only be determined through strict ethnographic observations that are directly relevant to archaeology. Better still, we should refer to ethnoarchaeological studies which are the only ones that offer information (specific then general due to the multiplicity of studies) that is useful to archaeological research, because they do a analysis of materials in their systemic contexts (SCHIFFER 1978).

I am conscious of the fact that archaeology cannot provide an answer to all questions, but I believe that by multiplying the sources of references (for example with experimental archaeology: the aim of the experimental archaeology is to reproduce situations in which behaviors are simulated), it should be possible to provide a more accurate decoding of archaeological remains. We should also pay more attention to the principles of retrodiction from a prediction, as opposed to forcing a match between an archaeological reality and our fantasies as archaeologists. Finally, we should keep in mind that archaeological remains will inevitably have gaps, and thus that it is not possible to reconstruct all aspects of their production and less still the social relations that generated them. Consequently, the equation that serves as the title of this article should become: archaeobotany + ethnoarchaeology \Leftrightarrow palaeoethnobotany.

Résumé

Les analyses archéobotaniques dans les Andes centrales et septentrionales, dont les développements sont relativement récents, recourent très souvent à des modèles ethnographiques ou historiques pour interpréter les données archéologiques. Ce comparatisme, généralement mal contrôlé, aboutit très souvent à des hypothèses paléoehtnobotanique invérifiables, voire inacceptables. Sur quelles bases, donc, interpréter les données archéobotaniques ? Et surtout en avons-nous les moyens pour l'Amérique andine ? Nous prendrons comme exemple le site de Pampa Chica (Lurín, Pérou), et tenterons d'esquisser de voies de recherches.

Resumen

Los estudios arqueobotánicos en los Andes centrales y septentrionales, cuyos avances son recientes, recurren muy a menudo a modelos etnográficos o históricos para interpretar los datos arqueológicos. Este comparatismo, generalmente mal controlado, lleva a veces a formular hipótesis paleoethnobotánicas no verificables, y hasta inaceptables. ¿ Sobre qué bases pues podemos interpretar los datos arqueobotánicos ? ¿ Y sobre todo, tenemos de qué hacerlo en América Andina ? Tomaremos el sitio de Pampa Chica (Lurín, Perú) como ejemplo, e intentaremos esbozar algunos campos de investigación.

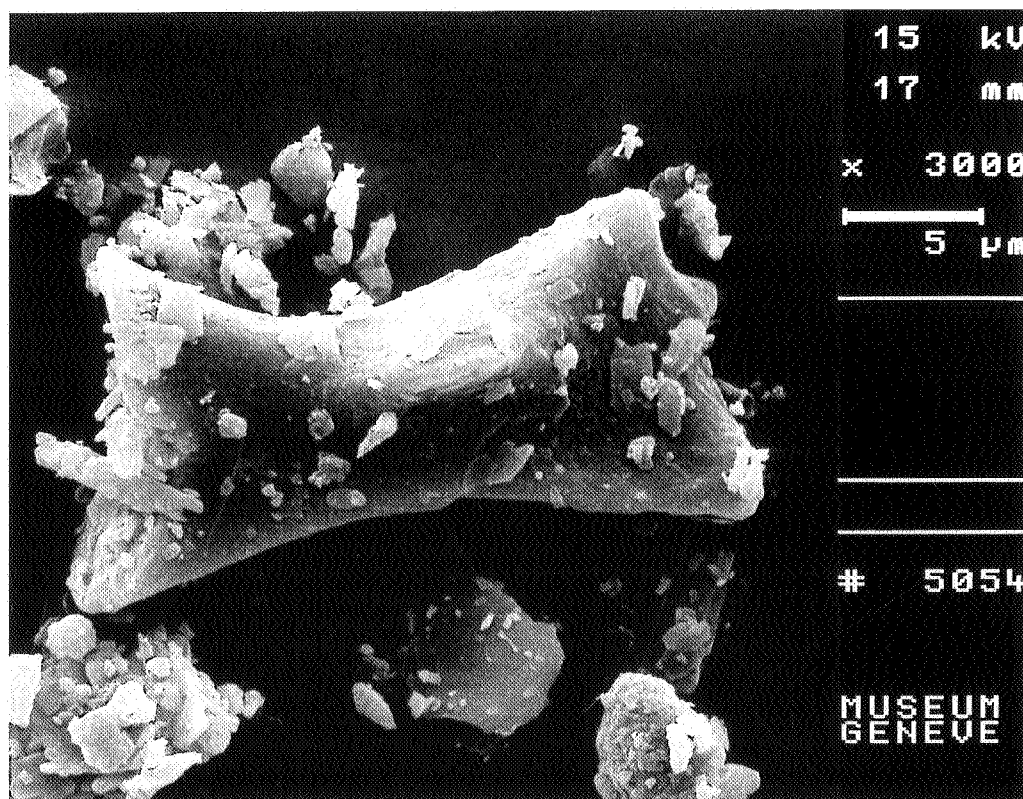


Figure 11: Panicoidae phytolith from Pampa Chica recinto 22 ceramics, possibly from maize.

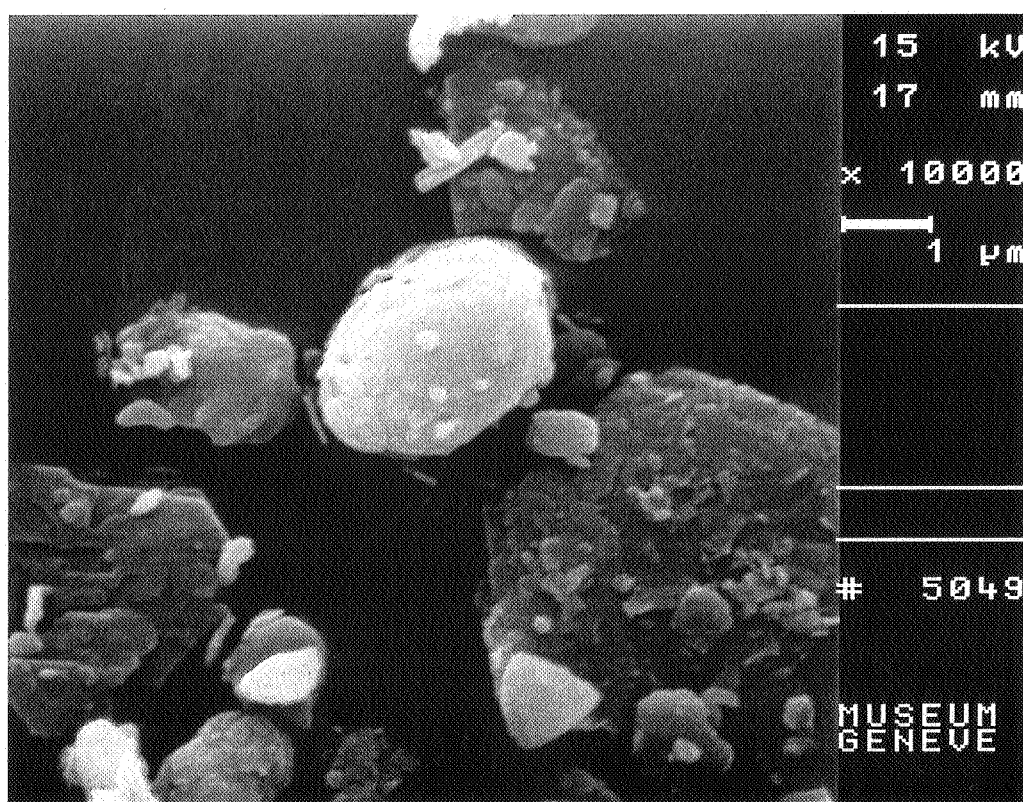


Figure 12: Starch grain from Pampa Chica recinto 22 ceramics, possibly from maize.

Bibliography

ANDERS Martha

- 1991 «Structure and Function at the planned site of Azangaro: cautionary note for the model of Huari as a centralized secular state», in: ISBELL William (éd.), *Huari Administrative Structure: prehistoric monumental architecture and state government*, pp. 165-197.- Washington: Dumbarton Oak.

BENZ Bruce

- 1994 «Reconstructing the racial phylogeny of Mexican maize: where do we stand», in: JOHANNSEN Sissel et Christine HASTORF (éds.), *Corn and culture in the prehistoric New World*, pp. 157-180.- Boulder (CO): Westview Press.

BONAVIA Duccio

- 1982 *Los Gavilanes: precerámico peruano, mar, desierto y oasis en la historia del hombre*.- Lima: Cooperación Financiera de Desarrollo S.A. et Inst. Arqueol. Alemán.

BONAVIA Duccio, Alexander GROBMAN

- 1989a «Andean maize: its origins and domestication», in: HARRIS David et Gordon HILLMAN (éds.), *Foraging and Farming: the evolution of plant exploitation*, pp. 456-470.- London: Unwin Hyman. (One World Archaeology, 13)
- 1989b «Preceramic Maize in the Central Andes: A necessary Classification».- *American Antiquity* 54 (4): 836-840.

BURGER Richard

- 1987 «U-shaped complex, Cardal, Peru».- *National Geographic Research* 3 (3): 363-375.

CAMINO Lupe

- 1987 *Chicha de maíz: bebida y vida del pueblo de Catacaos*.- Piura: CIPCA.

CÁRDENAS J., J. RODRÍGUEZ y L. AGUIRRE

- 1997 «El material orgánico en Huaca de la Luna», in: UCEDA Santiago, ELÍAS MUJICA y Ricardo MORALES (éds.), *Investigaciones en la Huaca de la Luna 1995*, pp. 129-149 Trujillo: Universidad Nacional de Trujillo.

CEUNINCK Grégoire

- 1994 «Forme, fonction, ethnie: approche ethnoarchéologique des céramiques du Delta intérieur du Niger (Mali)», in: APDCA, *Terre cuite et société: la céramique, document technique, économique, culturel*, pp. 161-177.- Juan-les-Pins [rencontre int. d'archéol. et d'hist., 14; Antibes, 21-23 oct. 1993].

CHAPDELAINE Claude, Santiago UCEDA y M. MOYA

- 1997 «Los complejos arquitectónicos urbanos de Moche», in: UCEDA Santiago, ELÍAS MUJICA y Ricardo MORALES (éds.), *Investigaciones en la Huaca de la Luna 1995*, pp. 71-92.- Trujillo: Univ. Nacional de la Libertad.

CHEVALIER Alexandre

- 1993 *La côte centrale péruvienne du Préceramique final à l'Horizon Ancien: état des lieux*.- Genève: Département d'anthropologie, Université de Genève.
- 1999 «De la pomme de terre à la coca: statut de l'archéobotanique au Pérou et revue critique des données», in: CHEVALIER Alexandre, Leonid VELARDE et Isabelle CHENAL-VELARDE (éds.), *L'Amérique du Sud: des chasseurs-cueilleurs à l'Empire Inca*, pp. 43-61.- Oxford: Archaeopress. (BAR International Series, 746)

COBO Bernabé, Padre

- 1964 «Historia del Nuevo Mundo», in: MATEOS, F (ed.), *Obras del Padre Bernabé Cobo*.- Madrid. (Biblioteca de autores españoles, 91) [Atlas. Vol. 1]

CUTLER Hugh

- 1946 «Races of maize in South America».- *Botanical Museum Leaflets* (Harvard) 12 (8): 257-291.

CUTLER Hugh, Martin CÁRDENAS

- 1947 «Chicha, a Native South American Beer».- *Botanical Museum Leaflets* (Harvard) 13 (3): 33-60.

DJINDJIAN François

- 1991 *Méthodes pour l'archéologie*.- Paris: Armand Colin.

DULANTO Jahl, Luis CÁCERES, María Inés VELARDE et al.

- s.d. «Pampa Chica: un análisis de problemas de arquitectura, áreas de actividad y programas rituales», in: BURGER Richard, Krzysztof MAKOWSKI (éds.), *El Formativo de la Costa Central*.- Lima: PUCP. [sous presse]

EUBANK Dunn Mary

- 1979 «Ceramic Depiction of Maize: a Basis for Classification of Prehistoric races».- *American Antiquity* 44 (4): 757-774.

FELDMAN Robert Alan

- 1980 *Aspero, Peru: architecture, subsistence economy and other artifacts of a preceramic maritime chiefdom*.- Harvard university: Department of anthropology. [PhD]
- 1985 «Preceramic corporate architecture: evidence for the development of non-egalitarian social systems in Peru», in: DONNAN Christopher (éd.), *Early ceremonial architecture in the Andes*, pp. 71-92.- Washington: Dumbarton Oaks. [Conference of Dumbarton Oaks; Washington, 8-10 oct. 1982]

GALINAT Walton

- 1954 «Argentine popcorn as a modern relic of prehistoric corn».- *Maize Cooperation News Letter* 25: 26.

GALLAY Alain

- 1986 *L'archéologie demain*.- Paris: Belfond.

GILLIN John

- 1947 *Moche, a Peruvian Coastal Community*.- Washington: Smithsonian Institution. (Institute of Social Anthropology, 3)

GOULD Richard

- 1974 «Some current problem in Ethnoarchaeology», in: DONNAN Christopher (éd.), *Ethnoarchaeology*.- Los Angeles: University of California (Institute of archaeology Monographs, 4)
- 1978 «Beyond Analogy in Ethnoarchaeology», in: GOULD R. (éd.), *Explorations in ethnoarchaeology*, pp. 249-293.- Albuquerque: Univ. of New Mexico Press. (School of american research advanced seminar series)

GRIEDER Terence, Alberto BUENO MENDOZA, Jr., Earl SMITH et al.

- 1988 *La Galgada, Peru: a Preceramic culture in transition*.- Austin: Univ. of Texas Press.

GROBMAN Alexander

- 1982 «Restos botánicos: Maíz (*Zea mays*)», in: BONAVIA Duccio (éd.), *Los Gavilanes: precerámico peruano, mar, desierto y oasis en la historia del hombre*, pp. 157-178.- Lima: Cooperación Financiera de Desarrollo S.A. et Inst. Arqueol. Alemán.

GROBMAN Alexander, Wilfredo SALHUANA, Ricardo SEVILLA et al.

- 1961 *Races of maize in Peru*.- Washington: National academy of sciences. (National research council publication, 915)

GUAMAN POMA DE AYALA Felipe

- 1987 *Nueva crónica y buen gobierno*.- Madrid: Historia 16. [1613]

HASTORF Christine Ann

- 1990 «The effect of the Inka state on Sausa agricultural production and crop consumption».- *American Antiquity* 55 (2): 262-290.
- 1993 *Agriculture and the onset of political inequality before the Inka*.- Cambridge: Cambridge Univ. Press. (New studies in archaeology)

HASTORF Christine Ann and Timothy EARLE

- 1985 «Intensive agriculture and the geography of political change in the Upper Mantaro region of Central Peru», in: FARRINGTON Ian (éd.), *Prehistoric Intensive agriculture in the Tropics*, pp. 569-595.- Oxford: British archaeological reports. (Internat. Series, 232)

ISBEL William, Christine BREWSTER-WRAY and Linda SPICKARD

- 1991 «Architecture and spatial organization at Huari», in: ISBELL W. (éd.), *Huari administrative structure: prehistoric monumental architecture and state government*, pp. 19-53.- Washington: Dumbarton Oaks.

LEROI-GOURHAN André

- 1971 *Evolution et techniques, 1: L'Homme et la matière*.- Paris: Albin Michel. (Sciences d'aujourd'hui)

LUMBRERAS Luis Guillermo

- 1987 «Examen y clasificación de la cerámica».- *Gaceta Arqueológica Andina* (Lima) 4 (13): 3-4.

LYNCH Thomas

- 1980 *Guitarrero cave: early man in the Andes*.- New York: Academic Press.

LYNCH Thomas, R. GILLEPSIE, John GOWLETT et al.

- 1985 «Chronology of Guitarrero Cave, Peru».- *Science* 229: 864-867.

MANGELSDORF Paul, Richard MACNEISH and Walton GALINAT

- 1967 «Prehistoric wild and cultivated maize», in: BYERS D. (éd.), *Tehuacan Valley 1: environment and subsistence*, pp. 178-200.- Austin: University of Texas Press.

MANGELSDORF Paul and R. REEVES

- 1939 «The origin of indian corn and its relatives».- *Bulletin of the Texas agricultural experiment station* 574.

MCK BIRD Robert

- 1978 «Archaeological maize from Peru».- *Maize genetics cooperation newsletter* 52: 90-92.
- 1990 «What are the chances of finding maize in Peru dating before 1000 BC ? Reply to BONAVIA and GROBMAN».- *American Antiquity* 55 (4): 828-840.

MOORE Jerry

- 1989 «Pre-Hispanic beer in coastal Peru: technology and social context of Prehistoric production».- *American Anthropologist* 85 (3): 545-562.

MORRIS Craig

- 1974 «Non-agricultural production in the Inka economy: an institutional analysis», in: MOORE Charlotte (éd.), *Reconstructing complex societies*, pp. 49-60.- Cambridge: American school of oriental research.
- 1979 «Maize beer in the economics, politics, and religion in the Inca empire», in: GASTINEAU, C., W. DARBY and T. TURNER (éds.), *Fermented food beverages in nutrition*, pp. 21-34.- New-York: Academic Press.
- 1985 «From principles of ecological complementarity to the organization and administration of Tawantinsuyu», in: MASUDA Shozo, Izumi SHIMADA and Craig MORRIS (éds.), *Andean ecology and civilization: an interdisciplinary perspective on Andean ecological complementarity*, pp. 477-490.- Tokyo: University Press. [Wenner-Gren foundation for anthropological research symposium, 91; Cedar Cove (FL), USA, 18-25 May 1983]
- 1986 «Storage, supply, and redistribution in the economy of the Inka state», in: MURRA John, Nathan WACHTEL and J. REVEL (éds.), *Anthropological history of Andean politics*, pp. 49-60.- Cambridge: University Press.

MORRIS Craig and Donald THOMPSON

- 1985 *Huanuco Pampa: An Inca City and Its Hinterland*.- London: Thames & Hudson.

NICHOLSON Edward

- 1960 «Chicha Maize Types and Chicha Manufacture in Peru».- *Economic Botany* 14 (4): 290-299.

OSSIO Juan

- 1996 «Aspectos simbólicos de la comidas andinas: una nueva versión», in: OLIVAS WESTON Rosario (éd.), *Cultura, identidad y cocina en el Perú*, pp. 77-113.- Lima: Universidad San Martín de Porres.

PAUL Anne

- 1986 «Continuity in Paracas textile iconography and its implications for the meaning of linear style images», in: POLLARD ROWE Ann (éd.), *The Junius B. Bird conference on Andean textiles*, pp. 81-100.- Washington: The Textile Museum [Conference in Washington, 7-8 April 1984]
- 1990 *Paracas ritual attire*.- Norman, London: Univ. of Oklahoma Press (The civilization of American Indian)

PEARSALL Deborah

- 1978 «Phytolith analysis of archaeological soils: evidence for maize cultivation in Formative Ecuador».- *Science* 199: 177-178.
- 1989 *Paleoethnobotany: a handbook of procedures*.- London: Academic Press.
- 1992 «The origins of plant cultivation in South America», in: COWAN Wesley and Patty Jo WATSON (éds.), *The origins of agriculture: an international perspective*, pp. 173-205.- Washington: Smithsonian Institution Press.
- 1994a «Investigating New World tropical agriculture: contributions from phytolith analysis», in: HATHER Jon (éd.), *Tropical archaeobotany: applications and new developments*, pp. 115-138.- London/New York: Routledge (One world archaeology, 22).

PEARSALL Deborah

- 1994b «Issues in the analysis and interpretation of archaeological maize in South America», in: JOHANESSEN Sissel and Christine HASTORF (éds.), *Corn and culture in the prehistoric New World*, pp. 245-272.- Boulder (CO): Westview Press.

- 1995 «Domestication and agriculture in the New World tropics», in: PRICE Douglas and Anne Birgitte GEBAUER (éds.), *Last hunters-first farmers: new perspectives on the prehistoric transition to agriculture*, pp. 157-192.- Santa Fe (NM): School of american research press.

PEARSALL Deborah and Dolores PIPERNO

- 1990 «Antiquity of maize cultivation in Ecuador: summary and reevaluation of the evidence».- *American Antiquity* 55 (2): 324-337.

PIPERNO Dolores

- 1991 «Phytolith analysis in the American tropics».- *Journal of World Prehistory* 5 (2): 155-191.

PIPERNO Dolores and Deborah PEARSALL

- 1998 *The origin of Agriculture in the Lowland Neotropics*.- San Diego/London: Academic Press.

POPPER Virginia

- 1982 «Restos botánicos: análisis general de las muestras», in: BONAVIA Duccio (éd.), *Los Gavilanes: precerámico peruano, mar, desierto y oasis en la historia del hombre*, pp. 148-156.- Lima: Cooperación Financiera de Desarrollo S.A. et Inst. Arqueol. Alemán.

POZORSKI Shelia, Thomas POZORSKI

- 1987 *Early settlement and subsistence in the Casma valley, Peru*.- Iowa City: University Press.

PROULX Donald

- 1968 *Local differences and time differences in Nasca pottery*.- Berkeley: University of California Press. (Publication in Anthropology, 5)

REICHERT Edward

- 1913 *The differentiation and specificity of starches in relation to genera, species, etc.*- Washington: Carnegie Instit.

ROSTWOROWSKI DE DIEZ CANSECO María

- 1967-68 «Ethnohistoria de un valle costeño durante el Tawantinsuyu».- *Revista del Museo Nacional* 35.
- 1977 «Coastal fishermen, merchants, and artisans in pre-Hispanic Peru», in: BENSON E. (éd.), *The sea in the pre-Columbian world*, pp. 167-186.- Washington: Dumbarton Oaks.

ROSTWOROWSKI DE DIEZ CANSECO María

- 1986 *Estructuras andinas del poder: ideología religiosa y política*.- Lima: Instituto de Estudios Peruanos.
- 1989 *Costa peruana prehispánica*.- Lima: Instituto de Estudios Peruanos.

SABOGAL WIESSE José

- 1982 *La cerámica de Piura*.- Quito: Instituto andino de artes populares.

SCHIFFER Michael

- 1978 «Methodological Issues in Ethnoarchaeology», in: GOULD Richard (éd.), *Explorations in Ethnoarchaeology*, pp. 229-247.- Albuquerque: University of New Mexico press. (School of american research advanced seminar series)

SCHREIBER Katharina

- 1991 «Jincamocco: a Huari Administrative Center in the South Central Highlands of Peru», in: ISBELL William (éd.), *Huari Administrative Structure: Prehistoric Monumental Architecture and State Government*, pp. 199-213.- Washington D.C.: Dumbarton Oaks.

SHIMADA Izumi

- 1976 *Socioeconomic organization at Moche V Pampa Grande, Peru: prelude to a major transformation to come*.- Arizona University: Department of anthropology. [PhD]
- 1994a «La producción de cerámica en Morrope, Perú: productividad, especialización y espacio vistos como recursos», in: SHIMADA Izumi (éd.), *Tecnología y organización de la producción de cerámica prehispánica en los Andes*, pp. 295-320.- Lima: Pontificia Univ. Católica del Perú.
- 1994b *Pampa Grande and the Mochica Culture*.- Austin: Texas University Press.

STUIVER M, A. LONG and R. KRA

- 1993 *Radiocarbon* 35 (1).

UMLAUF Marcelle

- 1988 *Paleoethnobotanical investigations at the initial period site of Cardal, Peru*.- Columbia: Univ. of Missouri-Columbia, Dep. of Anthropology. [Unpublished M.A Thesis]
- 1993 «Phytolith evidence for initial period maize at Cardal, Central coast of Peru», in: PEARSALL Deborah and Dolores PIPERNO (éds.), *Current research in phytolith analysis: applications in archaeology and paleoecology*, pp. 125-130.- Philadelphia: Univ. of Pennsylvania. (MASCA research papers in sci. and archaeol., 10)