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E D I T O R I A L

Archaeobotany in South America: Landscape, diet, and use of plants in the past

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This special issue dedicated to plants in archaeological context was launched at a symposium in the XVII Congress of the Society of Brazilian Archaeology in 2013 that brought together several of the authors reunited here to discuss the theme 'Archaeobotany'. The proposal has since then been extended in order to provide an overview, albeit incomplete, of the current academic production in South America and by this means highlight the diversity and importance of cultural data that can be obtained through these studies.

The origins of Archaeobotany date back to the XIXth century. The earliest known studies were carried out by botanists and geologists interested in archaeological material. German botanists Carl Sigismund Kunth and Georg August Schweinfurth analyzed desiccated plant remains from Egyptian funerary contexts (KUNTH 1826; SCHWEINFURTH 1887 apud CHEVALIER 2002). Swiss geologist and naturalist Oswald Heer, pioneer of Palaeobotany, first recognized the importance of investigating plant remains from archaeological sites for the reconstruction of diet and environment of prehistoric people, and identified numerous waterlogged plant remains from Neolithic lake-dwellings in Switzerland (HEER 1866; see also JACOMET 2004). French botanists Charles Saffray, Alphonse de Rochebrune, and German Ludwig Wittmack identified fibers and other plant macroremains from Peruvian sites (SAFFRAY 1876; ROCHEBRUNE 1879; WITTMACK 1880-87). American botanist John William Harshberger, pioneer of Ethnobotany, identified archaeological plant material from both Colorado caves (HARSHBERGER 1896) and Peruvian sites (HARSHBERGER 1898).

It is not my intent to present a detailed history of the discipline, a task that many authors have accomplished in different contexts (e.g. RENFREW 1973; FORD 1979; HASTORF 1999; PEARSALL 2000; FULLER 2002). Suffice to say that innumerable works were made in various parts of the world since then. The discipline showed a great development from the 1970s, both in the "Old World" and in North America, and especially after the 1990s (cf. HASTORF 1999; PEARSALL 2000; FULLER 2002).

In Europe, the theoretical and methodological foundation of the discipline began to be established as a result of the intensification of archaeobotanical studies in the 1960s, aiming both at local problems and often at investigations on the origins of agriculture in the Near East. Among the pioneers and leading archaeobotanists stand the Danish Hans Helbaek, German Maria Hopf and Karl-Ernst Behre, Dutch Willem

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van Zeist, Polish Krystyna Wasylikowa, Swiss Stefanie Jacomet, among others (e.g. HELBAEK 1959; HOPF 1969; VAN ZEIST 1967; WASYLIKOWA 1978; VAN ZEIST et al. 1991; JACOMET et al. 1991; ROSCH et al. 1992). An important role was also played by the Cambridge Palaeoeconomy School, directed by British archaeologist Eric Higgs, who, due to his great interest in aspects of subsistence and site catchment analysis (VITA-FINZI and HIGGS 1970), greatly encouraged the development of flotation and of archaeobotanical studies (e.g. JARMAN et al. 1972).

In North America, the great pioneer of Archaeobotany was the biologist and ethnobotanist Volney Jones. He worked with Melvin Gilmore, eminent ethnobotanist who developed an important work with Native Americans as well as some archaeobotanical identifications (e.g. GILMORE 1931). Jones established the principles of the discipline as a part of Ethnobotany (JONES 1941), developed methods of retrieval, analysis, and identification for different categories of plant remains, and gathered an extensive ethnobotanical collection containing wood, seeds, and other plant parts from different regions of the world (FORD 1994; MAA 2016). Jones formed an important generation of Americans archaeobotanists, including Richard Yarnell, Vorsila Bohrer, and Richard Ford, which in turn formed new professionals and spread the practice of discipline, consolidating its theoretical and methodological bases (e.g. FORD 1979; GREMILLION 1997; PEARSALL 2000).

In 1959 Helbaek proposed the term "Palaeoethnobotany" to the "study of the interrelationships between human populations and the plant world through the archaeological record" (HELBAEK 1959). This term was quickly adopted in the United States, a country with a long tradition in Ethnology and Ethnobotany. It should be noted that the very origin of the term "Ethnobotany", coined by John Harshberger in 1895 to denote the study of “plants used by primitive and aboriginal people”, was related to the analysis of archaeological remains (HARSHBERGER 1896). Volney Jones defined it as "the study of the interrelations of primitive man and plants" (JONES 1941), but for Margaret Towle this concept would include "the study of the relationship between man and the plant world, *without limits to time or to the degree of his cultural development*" (TOWLE 1961 apud PEARSALL 2000). Later, in seminal articles, Richard Ford differentiated "Ethnobotany" ("study of direct interrelations between humans and plants" – FORD 1978) from "Palaeoethnobotany" ("analysis and interpretation of the direct interrelationships between humans and plants for whatever purpose as manifested in the archaeological record" – FORD 1979).

Thus, for most North American authors, the concept of "Palaeoethnobotany", defined as the interpretive study of the interrelationships between humans and plants ("analysis and interpretation of archaeobotanical remains to provide information about the interaction of human populations and plants" – POPPER and HASTORF 1988), is opposed to "Archaeobotany", which would be limited to the methods of treatment and identification of the plant remains themselves ("the methods for collecting, identifying, and recording the data, and noncultural interpretations of the data" – POPPER and HASTORF 1988).

This difference, however, is not usually recognized by European researchers, who don’t restrict

"Archaeobotany" to taxonomic and descriptive perspectives, but rather study plant remains in archaeological context seeking to understand the interrelations between humans and plants in their various approaches – including ecological, economic, social, and ideological aspects (e.g. BUXÓ et al. 2005; FULLER and HARVEY 2006; MERCURI et al. 2010; MADELLA et al. 2014). The website of IWGP (International Workgroup for Palaeoethnobotany) states that: "Palaeoethnobotany (synonym: Archaeobotany) is the part of environmental archaeology which concerns the study of plant remains preserved on, or in association with, archaeological sites. *Archaeobotany is mainly interested in the activities carried out by past populations*." (IWGP 2016).

A review of the literature shows that in the "Old World" the two terms are often used interchangeably and that the discipline's appellation is not ordinarily a matter of discussion. In North America, although the abovementioned definitions are well accepted, the subject is often raised, due to the confusion that is created by the different interpretations given to the term "Archaeobotany" on both sides of the Atlantic (see HASTORF 1999). Some American researchers, however, use both terms interchangeably (e.g. MIKSICEK 1987).

In South America, on the other hand, naming the discipline is still a source of hesitation. And that in spite of a round table held in 2007 on the "IV International Meeting on Archaeological Theory in South America" (Argentina), which extensively discussed the issue from semantic, historical, epistemological, and semiotic points of view (cf. GIOVANNETTI et al. 2008; KORSTANJE 2008; RODRIGUEZ 2008). In South America, probably due to the many influences on the formation of researchers, the concept of "Archaeobotany" has never acquired a purely technical meaning, and in most cases there seems to be a tendency of using both terms as synonyms.

I argue that "Archaeobotany" and "Palaeoethnobotany" are strict synonyms, and thus perfectly interchangeable in any context. On the one hand, it is true that the prefix "ethno-" specifically refers to the human aspect. On the other hand, one must bear in mind that Archaeology is primarily a human science, and consequently the cultural dimension of archaeological interpretations is inherent and inseparable from the discipline. Precisely for this reason, apropos, I tend to advocate the use of "Archaeobotany", a term that emphasizes its archaeological affiliation.

For the same reason, I suggest that the study of phytoliths, starch grains, and other plant microremains found in archaeological context, which recently began to be referred to as "Micropalaeoethnobotany" (e.g. DEL PUERTO et al. 2014), might be designated as "Microarchaeobotany", term which carries the double advantage of being shorter and, once again, to emphasize the archaeological affiliation of the discipline.

Moreover, it is quite frequent, particularly outside the specialist community, to misuse the term "Palaeobotany" for "Palaeoethnobotany", which only increases the confusion. "Palaeobotany" is "the branch of Palaeontology in charge of studying fossil plants" (IANNUZZI and VIEIRA 2005), i.e., it is the study of plant

remains that "suffered physico-chemical transformations in sedimentary or diagenetic environment". Analysis of these materials falls within the field of Biology and Geology, and aims to understanding the processes of life and Earth evolution, as well as allowing economic applications related to the energy sector (oil, coal etc.) (IANNUZZI and VIEIRA 2005). Therefore, this discipline has nothing to do with plants found in archaeological context and, consequently, the term cannot be used to refer to the study of remains associated with the human past and cultural issues.

In South America, Archaeobotany is still relatively young. Although studies of desiccated macroremains have been performed since the beginning of the discipline, especially in Peru (e.g. SAFFRAY 1876; ROCHEBRUNE 1879; WITTMACK 1880-87; HARSHBERGER 1898), these analyses were often conducted by foreign researchers and/or by non-archaeologists, and hence they were not initially accompanied by the development of a relevant local archaeobotanical tradition.

In the northwest of the continent the evolution of the discipline was marked by a long tradition of research by American archaeobotanists. Several authors performed important work, such as Margaret Towle, Shelia Pozorski, Donald Ugent, Deborah Pearsall, Christine Hastorf, Sissel Johannessen, in Peru (e.g. TOWLE 1961; POZORSKI 1979; PEARSALL 1980; UGENT et al. 1982; HASTORF 1990; JOHANNESSEN and HASTORF 1990), Deborah Pearsall and Dolores Piperno, in Ecuador (e.g. PEARSALL 1978; PIPERNO 1990), among others. More recently, studies in Peru diversified (see CHEVALIER 2002), while the work of Colombian archaeobotanists such as Inês Cavelier, Gaspar Morcote, and Sonia Archila came to stand out (CAVELIER 1995; MORCOTE 1994; ARCHILA 2005).

In the Southern Cone, the pioneering works were generally developed by botanists and agronomists, with strong emphasis on issues related to plant domestication (e.g. PARODI 1935; HUNZINKER 1943; BURKART 1952; KRAPOVICKAS 1968; CÁMARA HERNÁNDEZ 1973 – APUD YACOBACCIO and KORSTANJE 2007). Archaeologists became more directly interested by these issues from the 1970s, although the botanical identifications have continued to be made by non-archaeologists (cf. YACOBACCIO and KORSTANJE 2007; LEMA 2008). This began to change from the 1980s, when effective archaeobotanical work started to develop (e.g. POCHETTINO and SCATTOLIN 1991; CORTELLA and POCHETTINO 1994), accompanied by field and laboratory methodological concerns (cf. LEMMA 2008). However, it was particularly from the 1990s that the studies began to multiply. There is a strong investment in microremains analyses, concurrent to a significant development of phytolith analysis in various areas of knowledge (cf. BERTOLDI DE POMAR 1971; ZUCOL et al. 2008). Noteworthy microarchaeobotanical researches are led by Pilar Babot and Alejandra Korstanje in Argentina (e.g. BABOT 1999; KORSTANJE and WÜRSCHMIDT 1999; KORSTANJE 2002; KORSTANJE and BABOT 2007), Laura del Puerto and Jose Iriarte in Uruguay (e.g. DEL PUERTO and INDA 2003; IRIARTE et al. 2004), and María Teresa Planella in Chile (e.g. PLANELLA and MCROSTIE 2005; PLANELLA et al. 2012); besides researches on charcoal and other macroremains, such as those by María Eugenia Solari in Chile (e.g. SOLARI 1990, 1993) and Aylen Capparelli, Bernarda Marconetto, and Maria Fernanda Rodriguez in

Argentina (e.g. CAPPARELLI and RAFFINO 1997; MARCONETTO 1999; RODRIGUEZ 2004). Currently, a new and productive generation of researchers is being formed; publications and research lines have been multiplying accordingly.

In Brazil, Archaeobotany was virtually non-existent until the end of the 1990s, except for a few identifications of plant macroremains held at the request of archaeologists (e.g. ROOSEVELT et al. 1996; MAGALHÃES 1998), and more rarely for agronomists or botanists interested by the discipline (e.g. FREITAS et al. 2003). More systematic studies began with Anthracology (e.g. SCHEEL-YBERT 1999), and were marked from the beginning by a strong concern with theoretical, methodological and interpretative issues (SCHEEL-YBERT et al. 2003; SCHEEL-YBERT 2004). They were soon followed by the first studies with plant microremains (WESOLOWSKI 2007; BOYADJIAN 2007; CASCON 2010). Analyses of carporemains (fruits, seeds, and other structures related to the reproductive organs of plants) and of underground organs, however, remain rare (SHOCK 2010).

Interestingly, a specificity of the South American continent is the integration of Anthracology within the archaeobotanical specialties (e.g. SCHEEL-YBERT 2004; SOLARI 2007; BELMAR and LEMA 2015), unlike in Europe, where it is generally regarded as an independent discipline. Another specificity to consider is the very definition of the discipline. Anthracology was initially defined as "the study of wood charcoal collected from archaeological or natural sediments" (CHABAL 1997), with the objective of "primarily reconstituting the evolution of the local flora, as well as the plant environment in which humans have lived" (THIÉBAULT and VERNET 1987). In the South American practice, however, and especially in Brazil, anthracological studies consider all the charred remains preserved in archaeological context (wood, fruits and seeds, underground organs, and others), thus comprising a number of other important issues for archaeological research. In this context, therefore (which in Europe is called "Archaeoanthracology"), Anthracology might be defined as the "analysis and interpretation of charred plant remains" aiming to "provide data that contribute to understand the interrelationships between humans and the landscape, as well as the lifeways of past populations" (SCHEEL-YBERT 2013).

An overview of the current research shows that there is a strong investment in Archaeobotany in several South American countries – even though, unfortunately, not all are represented in this volume. From the last decade, it is clear that the discipline began to shift its focus from predominantly methodological concerns and increased its interest in theoretical issues (e.g. MARCONETTO et al. 2007; ARCHILA et al. 2008; BELMAR and LEMA 2015), as has already happened in other parts of the world (cf. FULLER 2002). This issue aims to present the latest developments of the discipline by bringing an incomplete view, but expectedly a comprehensive one, of the current research in the continent.

In the first part, dedicated to Microarchaeobotany, seven articles are presented. The first ones introduce case studies in Southern Brazilian sites using starch grains and phytoliths analyses. Analyses performed on dental calculus from a sambaqui (BOYADJIAN et al.) and on pottery from pit houses structures

(CORTELETTI et al.) revealed a large diversity of remains and led to the identification of broad subsistence bases for the two groups considered, besides allowing inferences on economy and mobility. Other case studies, in a cerrito and associated sedimentary deposits in Uruguay (DEL PUERTO et al.) and in raised fields from Bolivia (DICKAU et al.), used phytoliths analysis. Both allowed landscape reconstructions and provided inferences on food production and sites formation processes, raising questions concerning interactions between humans and the landscape as well as the strategies adopted to deal with the environment. Follow two synthesis papers, presenting the evolution of the landscape in the La Plata Basin since the Middle Holocene (IRIARTE) and the knowledge accumulated on domesticated plants from northwestern Argentina (KORSTANJE), and an argumentation concerning the plants used in Argentinean salt Puna in the last 10,000 years (BABOT).

In the second part, dedicated to Anthracology, six papers are presented. A case study in Central Amazon offers a new approach to understanding cultural practices, essentially by the quantification of charred plant macroremains (SILVA et al.). Two studies in prehistoric sites in Brazil, focusing on hunter-gatherers of Mato Grosso shelters (BACHELET) and Southern Proto-Jê pottery makers (AZEVEDO and SCHEEL-YBERT) allowed landscape reconstructions, inferences about fuel economy and, for the latter, fire management practices. Follow a synthesis of data from different Brazilian ceramic sites (SCHEEL-YBERT et al.) and a study of pre-hispanic and colonial contexts in northwestern Argentina (MARCONETTO and MAFFERRA). Both led to alternative interpretations of data on wood use and landscape, anchored not in economistic or functional logic, but rather in ideological and cultural perspectives. Finally, the volume ends with a guest article from a French anthracologist (THÉRY-PARISOT et al.), which proposes a socio-economic approach to Anthracology and uses experimentation as a means to understand management practices and firewood use in prehistory.

The ensemble of these texts reinforces the importance of studying the ecofacts, already widely established as sources of cultural data, which allow addressing issues such as landscape, subsistence, food production, and plants use, up to ritual and symbolic approaches, and even site formation processes. This issue also attests that, like in the rest of the world, South American Archaeobotany in the XXIth century is no longer in the position of a mere analytical technique or a "related discipline" to Archaeology. Rather it is entirely an archaeological specialty, most often practiced by archaeologists, who investigate biological remains in order to answer to archaeological problems, identifying the actions, motivations, and social processes that led to the presence of such remains in a given context aiming to understand cultural aspects.

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