Chapter 16
Lithic Technology in Lagoa Santa in the Early Holocene

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Abstract In this chapter, we delineate a brief history of the interpretations about lithic technological variability in Lagoa Santa region during the early Holocene. We begin presenting some considerations about Lagoa Santa lithic industry made by studies undertaken during the nineteenth and twentieth centuries. After that, we present the general characteristics of two lithic collections that we have studied and that were made on the course of the twentieth and twenty-first centuries. We discuss the interpretations formulated regarding the composition and significance of the lithic industry in the Lagoa Santa region, especially in the aspect of its role as an indicator of time and space. The central issue concerns the proposals of artefact homogeneity and variability and their implications for understanding the process of occupation of the LagoaSanta karst. Based on these data, we propose, even though the lithic technology of Lagoa Santa continues to be largely undefined, that the image of a simple, homogenous lithic industry of little interest is no longer sustainable. What we see is a technological organization that integrates different areas: the circulation of raw material, the combination of different techniques in exploiting those raw materials and the production of artefacts with diversified uses and meanings, constructing a mosaic of choices that define the specificity of that industry.

Introduction

Ever since the early nineteenth century, the Lagoa Santa region has played and continues to play an essential role in the formation of Brazilian archaeology as the focus of intense debate in national and international spheres. This book portrays the

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trajectory of that role and highlights the main points of interest and discussion. Quantitatively, the lithic remains constitute the majority of the archaeological remains collected by various researchers who have investigated the region, but, with few exceptions (see Beltrão 1974; Hurt and Blasi 1969; Walter 1958), they have received little or no attention from those scholars.

In this chapter, we delineate a brief history of considerations made, concerning the Lagoa Santa lithic industry, by studies undertaken in the course of the nineteenth and twentieth centuries, followed by a presentation of the general characteristics of two collections, namely, (1) the collection of lithic remains formed in the course of the project “Origins and Microevolution of Man in the Americas: a paleoanthropological approach” and (2) the collection of lithic remains stored in the National Museum of the Federal University of Rio de Janeiro (UFRJ). Lastly, we will discuss the interpretations formulated regarding the composition and significance of the lithic industry in the Lagoa Santa region, especially in the aspect of its role as an indicator of time and space. The central issue concerns the proposals of artefact homogeneity and variability and their implications for understanding the process of occupation of the Lagoa Santa karst.

History of the Research

For almost 200 years now, the Lagoa Santa region has been the object of archaeological research, but the lithic industry there has never been a top priority for any of the researchers. In this chapter, we present a brief synthesis of the production of several authors with the intention of highlighting the character that most of them seem to attribute to the lithic material of that region in the aspect of its technological variability.

In various works, we can readily recognize a set of characteristics attributed to the lithic collections from the excavated sites, which are almost exclusively rockshelters. The first characteristic is the abundant presence of quartz flakes and other quartz fragments at all the sites. The second is the presence of polished stone axe blades, which present different degrees of polishing and or previous knapping. The third aspect is the notable absence of standardized artefacts that can easily be recognized because the secondary alterations produced in the flakes and other surfaces are slight and not formalized. The fourth, also shared by various authors, is the absence of great variation among the different stratigraphic layers, obviously only commented on by those authors that took the stratigraphy into account.

In the pioneering research that Peter Lund undertook in the nineteenth century and Padberg-Drenkpholh in the early decades of the twentieth century, the lithic production is not the object of any discussion at all. That is mainly due to the fact that their energies were directed at what they considered to be most notable and scientifically relevant in that regional context, namely, the possible coexistence of humans with extinct Pleistocene fauna species, as proposed by Lund and discussed by Padberg-Drenkphohl. A second reason for the lack of interest in the lithic artefacts
could be associated to their lack of formal standardization, as we believe that if there had been any sophisticated artefacts with an evident morphological standard or that appealed to the aesthetic sensibility of the researchers, then those artefacts might have been the object of important considerations (especially in regard to solving the question of the possible coexistence and predation of the Pleistocene megafauna).

Unlike the two pioneer researchers, the amateur archaeologists who composed the Minas Gerais Academy of Sciences from 1930 to 1950 did conduct analyses of the lithic material and put forward their own interpretative proposals (Hurt and Blasi 1969; Mattos 1938; Walter 1958). H. V. Walter actually proposed a typology for the flaked and polished artefacts and attempted to organize them in an evolutionary scheme, an effort which Prous identified as being obviously inspired by European schemes for establishing prehistoric periods (Prous 2013). What was essentially lacking in Walter’s work to support such proposals was information on the stratigraphic contexts of the artefacts (Hurt and Blasi 1969; Prous 2013).

The collaborative activities of Wesley Hurt and Oldemar Blasi marked the beginning of professional archaeological research in the Lagoa Santa region. Their research treated the lithic industries as being important, even though they were not actually the main focus of the investigations. Those authors constructed a typology for the sets of artefacts found in the area, and, combining it with contextual information, they proposed the existence of a Cerca Grande complex, embracing the totality of the various categories of remains (among them the lithic material) and corresponding to the pre-pottery occupations of the karst sites.

Within the span of that overarching complex, however, the authors did not manage to clearly distinguish periods or sub-sets because they could not detect any notable changes related to the stratigraphy of the sites. Furthermore, even though there were outstanding spatial variations, it proved impossible to understand them other than as being, perhaps, the result of sample biases or possible casual factors.

Their typology was based on inferences regarding the function of the pieces. As an example, they referred to “an amphibolite axe with a wide rounded base”, “a large long axe made from an amphibolite pebble”, “borer”, “cutters”, “end scraper”, “asymmetrical knives” and so on. What is most noticeable in Hurt and Blasi’s work is their interpretation of the huge numbers of quartz pieces they found. Despite the typology, their emphasis was always on those pieces that they recognized as artefacts, while the residues of their production were never the object of any in-depth analysis. Here is what Hurt (1960: 583) had to say about the lithic assemblage:

The stone industry was composed predominantly of quartz crystal flakes. Hundreds of flakes and fragments of quartz crystal flakes were found. It is improbable that all these flakes and fragment represent the spoils and rejects from tool manufacture, but seem to be the tools themselves. If they were the spoils and rejects we would expect to find an accompanying large number of deliberately formed tools. Such was not the case, for only a few artifacts have a deliberate fabricated form or retouched edge.

The extensive work carried out by the Franco-Brazilian Archaeological Mission coordinated by Annette Laming-Emperaire included test pits at various sites and the excavation of a large area at the Lapa Vermelha IV in Pedro Leopoldo

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(Laming-Emperaire et al. 1974). Various stone materials were obtained in those test pits and in surface collections. The Mission made it possible to establish the basis for a new range of approaches not only to the lithic industry but also to many other aspects of the archaeological deposits (see Chap. 7 of this volume).

The need to describe the local industries, which were obviously different from the European ones, led A. Laming-Emperaire to propose a specific vocabulary to characterize the Brazilian lithic industries in an attempt to establish a common lexicon that would make it possible to compare materials from different regions and support the effort then being made to begin the technological characterization of the various artefacts assemblages. However, the initial descriptions stemming largely from impressions in the field reaffirm the aspects referred to by Hurt and Blasi. In her article, which appeared in the publication of results edited by the Mission in 1975, M. C. Beltrão (1974: 130) synthesizes her perception of the lithic materials collected at the Sumidouro, Lapa Vermelha IV, Lapinha I, Caieiras, Cerca Grande and General Carneiro sites in these words:

In that assemblage, we can already identify the poverty of the industry, not only from the technical point of view but also from the functional angle (the absence of arrowheads and spear points is particularly noticeable); a certain diversity of types is only found in the pottery level. Most of the tools are small or medium sized and the bigger, heavier ones among them are mostly found at the surface, sometimes associated with small Tupi-Guarani flaked quartz instruments. The most used stone is opaline or hyaline quartz followed by limestone (free translation from the French).

As a result of the activities of the French Mission’s researchers, a permanent archaeology nucleus was established at the Federal University of Minas Gerais coordinated by André Prous, who was a member of the mission team. The archaeological research unfolded with the Lagoa Santa karst as its main scenario, but the lithic collections were not intensely exploited (Prous 1991a). The excavations that Prous coordinated were mostly concentrated beyond the limits of the karst in the first lines of quartzite outcrops of the Serra do Espinhaço, that form the limit of the karstic plateau to the east.

The Grande Abrigo de Santana do Riacho was the top priority for excavation, and a great amount of lithic material came from it. Just like the karst material, it consisted largely of quartz flakes. In the case of the Santana do Riacho industries, systematic analyses were carried out with special attention to identifying the technology used to manufacture the pieces, and, for the first time in the central region of Minas Gerais, the totality of the lithic material was attributed due to its importance in the analyses (Prous 1991b).

Various articles appeared based on that work describing the industries associated to different moments of occupation, the stone flaking methods (Prous 1991b) and the bipolar flaking technique (Prous and Lima 1986/90), which was predominant at Santana do Riacho, and, in the years that followed, came to be identified in various other Brazilian archaeological contexts, including some sites in the Lagoa Santa karst.

At that time, however, technological studies were restricted to the Serra do Cipó assemblage, and it proved necessary to wait for years until research could be taken
up at the sites in the Lagoa Santa karst by the Origins project (Neves and Piló 2008; see Chap. 9 of this volume), in the beginning of the twenty-first century, for studies with the lithic material were undertaken once more.

In 2007, F. Pugliese’s dissertation for a master’s degree, entitled Os sítios de Lagoa Santa: um estudo sobre organização tecnológica de caçadores-coletores do Brasil Central (The Lagoa Santa sites: a study of the technological organization of the hunter-gatherers of Central Brazil), took up once more systematic analyses targeting the collections from the Lapa do Santo and Lapa das Boleiras sites in which he underscores the notable lack of variation in the artefacts within and among the different sites. The author notes that eventual variations are merely quantitative and not qualitative, and he attributes that to the greater or lesser intensity in the exploitation of resources in the vicinity of each site.

Pugliese’s interpretation, relating the degree of variability among the industries to the functionality of the sites, indicates an understanding whereby the sites are areas for specific activities “given that the low degree of variability of the instruments is not consonant with residential kinds of sites” (Pugliese 2007: 123). The same author (Pugliese 2007: 125) states that “the quality and stratigraphic distribution of the lithic material together with its temporal amplitude suggest that the rockshelters were places for specific activities, and that they were intensely abandoned and re-occupied during the Early Holocene”.

Thus, to some extent, the results of Pugliese’s work underscore Hurt and Blasi’s affirmations of a low degree of variability in the artefacts, and, whatever differences do exist among the sites and stratigraphic levels of the same site, they are largely quantitative.

Lagoa Santa Lithic Assemblages: The Origins Project Activities and the National Museum Collection

During postdoctoral research entitled “Lithic technology in Central Brazil: diversification and regionalization at the beginning of the Holocene” conducted by one of us (LB), we have analyzed lithic collections coming from excavations of archaeological sites in Lagoa Santa conducted by the Origins project. A preliminary analysis was also made of the archaeological material from the same region stored in the National Museum of the Federal University of Rio de Janeiro (MN-UFRJ).

In the case of the first analysis of the former material, the assemblage is composed by lithic collections from the sites excavated by the Origins project from 2000 to 2009 together with remains coming from spatially dispersed superficial archaeological occurrences. Among the sites in rockshelters, we took particular care with the organization of the Lapa do Santo collection, which had been the object of excavations since 2001, and of the Lapa das Boleiras site, excavated from 2001 to 2003. In the case of the former collection, we have proceeded with mass analysis in part of the collection, analyzing almost 10,500 pieces. For Lapa das Boleiras assemblage, we have made a quantitative analysis with artefacts and core
pieces, comparing the results with earlier work done by Francisco Pugliese in his master dissertation (Pugliese 2007).

Apart from the two sites in rockshelters mentioned above, an effort was made to organize all the available information regarding open-air sites and archaeological occurrences, consisting mainly of lithic remains. Special attention was dedicated to the sites around the Sumidouro Lake. That group of sites and occurrences was selected because of the great antiquity associated to some of them as, for example, the Coqueirinho site dated at around 10,240 BP (Bueno 2010) and the Sumidouro site with dates around 8200 BP (Araujo and Feathers 2008).

Lapa do Santo and Lapa das Boleiras: Organization and Analysis of the Collections

The Origins project worked most intensely at the Lapa do Santo archaeological site. It carried out annual excavations from 2001 to 2009, creating an immense collection of lithic remains (Neves et al. 2004, 2008).

Because of the methodology adopted for the excavation and collection of remains at the sites, we have basically two types of samples: material that was position-plotted and material that was obtained by sifting through sieves. The first type consists of remains collected individually with their exact location registered along three coordinates x, y and z. In such material is allocated a number identifying its origin at the site, which corresponds to the number used for marking and analyzing the piece. The second type consists of material retained in sieves, all of them coming from the same unit of excavation. That unit is composed hierarchically of information on the excavation unit, level and feature.

The plotted material amounts to around 4,100 pieces and includes remains of varying categories and raw materials. Such pieces were selected during the excavation process mainly based on size criteria. According to the excavation protocol applied at that site, any lithic material bigger than 1.5 cm was to be plotted. Based on an overall examination of the plotted material and the sifted material, we found that compliance with that orientation must have fluctuated somewhat during the various stages of excavation because, while there are no pieces with dimensions of less than 1.5 cm among the plotted material, the opposite is not true; there are pieces with such dimensions to be found in the sifted material.

To facilitate the analysis and make it feasible to obtain an estimate of the general situation of the lithic collection of that site, we reorganized the entire collection grouping the remains according to the area they were excavated from. Thus, all the pieces collected from the same unit were stored in the same box and organized according to stratigraphic levels and features, independently of what stage of curating they were at. Based on that organization, we estimated that the collection consists of around 40,000 lithic remains.

Regarding the analysis for this site, we decided to make a mass analysis (Ahler 1989). To conduct it, we adopted two criteria: raw material and size. During the
period of postdoctoral research, we analyzed 10,500 pieces using that method. First, we selected material that had been recovered from test pits opened up in the lower part of the site, because it seemed to be the part that presented greater diversity among the lithic remains. Later, we analyzed all the lithic material recovered from the F12 excavation unit (see Fig. 16.1). According to the dates obtained (Neves et al. 2008; Strauss 2010), all the remains recovered in the course of the excavations are associated to the occupation of the rockshelter during the early Holocene. The overall analysis and the descriptive statistical analysis have both been finalized for the assemblage recovered from the test pits. In the case of the F12 unit, the overall analysis has been finalized, but the statistical processing has not yet been concluded.

Thus, based on the analysis of the material from the test pits, we found the following characteristics displayed in graphic form in Figs. 16.2, 16.3, 16.4 and 16.5. In addition to the quantitative data obtained and displayed in Figs. 16.2, 16.3, 16.4 and 16.5, a series of qualitative observations were made during the analysis. First, although we identified the presence of flint, quartzite and silicified sandstone, nevertheless, the remains made of hyaline quartz were absolutely predominant, as can be seen from Fig. 16.2. Second, we detected the existence of raw materials exogenous to the Lagoa Santa karstic region such as the quartzite plates commonly found at archaeological sites in Serra do Espinhaço, Santana do Riacho and

Fig. 16.1 Lapa do Santo archaeological site (Adapted from Araujo et al. 2012)
Diamantina (Isnardis 2009; Prous 1991a). At the sites in the Serra do Espinhaço, those plates appear as supports for the production of artefacts with plano-convex or trapezoidal cross section and direct and subparallel or flaky reworking distributed along both edges, forming angles ranging from abrupt to semi-abrupt (Isnardis 2009). We found few examples of this kind of artefact at Lapa do Santo and all of them were fragmented, but in some stratigraphic levels, we found quartzite flakes that might have been associated to that reworking and resharpening of the cutting edges of those kinds of artefacts.
**Fig. 16.4** Distribution of lithic remains through stratigraphic levels at Lapa do Santo – remains of the test pits

**Fig. 16.5** Distribution of lithic raw materials through stratigraphic levels at Lapa do Santo – remains of the test pits

Another type of lithic remains that was found in the material from the test pits excavated at Lapa do Santo consisted of some very fine-grained, silicified sandstone flakes. This raw material is highly suitable for flaking. The flakes found were exceptional, and only a small quantity appeared, invariably associated to formal artefacts with a plano-convex cross section. They are usually small, fine, with a curved profile and a sequence of negatives on the external face whose orientation can vary from parallel to orthogonal and the base is worked. Another category of remains worth mentioning is the pyramidal quartzite cores with a pebble cortical platform and unipolar and unidirectional flaking.

Within the assemblage analyzed, there was a series of remains in flint. Two aspects caught our attention regarding that raw material: (1) the large number of fragments and remains with signs of heat-induced alterations and (2) the absence of any correlation of the fragments of that raw material with the final stages of forming artefacts. In other words, the flint, despite being scarce in the region and responding very well to knapping, did not seem to have undergone any process of appropriation different from that of the hyaline quartz.

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Lapa das Boleiras

For the Lapa das Boleiras site, we first made an initial organization of the collection, locating and grouping together remains from the same collecting points and systematizing all the data obtained by Pugliese (2007) in his master’s dissertation.

The data showed that 2,229 pieces had been collected from that site and that Pugliese (2007) had analyzed 1,895 (85%) of them. Considering that his analysis involved the observation of the attributes of each piece individually, we were able to extract information from his master’s dissertation on the proportions of raw materials and classes of remains as well as information on their distribution among the excavated areas and the stratigraphy.

In our analysis of the material from that site, we observed qualitative aspects regarding the artefact fabrication process and the appropriation of the cores. In the specific case of quartz crystal cores, we identified the following sequence previously presented in Bueno (2012: 74; Fig. 16.6):

These crystals first present one or a few reductions of the material by direct, unipolar percussion. Flakes are then struck off from the external, cortical surface of the platform defined at the apex of the crystal, alternating the types of flake. The first flake is totally cortical, the second flake may have a part of the body of the flake without cortex and a cortical external surface, and so on in alternating succession until the ridge being used as the percussion plane disappears, that is to say, it is exhausted. The result of that sequence, apart from the flakes it produces, is a core with a relatively flat knapping scar at one end and the
Fig. 16.7 Archaeological sites around Sumidouro Lake

...root of the crystal at the other. During the process of reducing the core, it may be rotated to take advantage of the angles available on the lateral faces of the crystal, and that may also serve to reactivate a ridge that has been exhausted. These unipolar reduction strategies can also be associated with bipolar knapping strategies, whereby the force is applied in the same direction as the crystal’s morphological axis, or again it may be applied in transversal direction in relation to that axis. In the latter case the form of the core, when it has been exhausted, will be somewhat globular and with the lateral cortexes still present. In some cases, such globular cores are re-used to fabricate small robust edges (Fig. 16.3). At sites like the Lapa das Boleiras and the Lapa do Santo, where there is an expressive number of cores, we can identify the association of those different strategies to the same single piece, while at the Sumidouro and Coqueirinho sites, evidence for the sequence described is obtained from the flakes there.

Open Air Sites and Occurrences Around the Sumidouro Lake

As has been mentioned, we gave priority to two of the various open-air sites around the Sumidouro Lake, namely, Sumidouro and Coqueirinho sites, where the lithic materials are chronologically situated in the early Holocene. Most of the other sites around the lake have very little lithic material, and they are associated to pottery remains (Fig. 16.7). Considering that the focus of the postdoctoral research was the occupation of the region in the early and middle Holocene, the analysis of remains from those other sites was postponed to a future moment.
The Origins project undertook research at the Sumidouro site in the years from 2003 to 2009 associated to systematic prospections in the surroundings of the Sumidouro Lake.\(^1\) Despite the intensity of the interventions there, the collection of lithic material it produced is relatively small. Twelve test pits of 1 m\(^2\) were made, and they were responsible for 140 lithic remains equivalent to a density of approximately 11 remains per m\(^2\) (Bueno 2012). Their distribution in the stratigraphy and from one test pit to another did not follow any definite pattern, except perhaps for the existence of slightly greater concentration in the lower part of the site near to the Sumidouro Lake and the Lund site. In addition to the lithic remains, pottery was also found at the site, such as a small bowl apparently broken in situ as well as remains of occupation within historical times that included iron and porcelain. Despite that diversity, both the pottery and the historical materials were only found predominantly in the superficial strata, whereas the lithic material appears in the entire extension of the stratigraphy. Another material identified frequently at this site was the charcoals, many of them forming great concentrations in certain levels of the stratigraphy. There is not always a clear association between such concentrations and the other archaeo logical remains, and they are often present in the so-called sterile levels (Neves et al. 2008). To investigate this association, a series of dates were made for this site, both from charcoals and from sediment samples (Araujo et al. 2013; Araujo and Feathers 2008). Some of the basic data obtained from this analysis are set out in Figs. 16.8, 16.9, 16.10, 16.11 and 16.12.

Parallel to that quantitative analysis, we made a qualitative analysis of the same material. Regarding the knapping of the quartz crystals, we identified three distinct

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\(^1\)For a characterization of the history of the interventions at that site, see Neves et al. (2004, 2008) and Araujo and Feathers (2008).
sequences: bipolar knapping following the longitudinal axis of the crystal, unipolar knapping of the apex of the crystal, and unipolar lateral knapping of the crystal, striking it in a transversal direction, usually on one of the flat faces at the point where three edges meet, and using as a guideline for the strike an edge that is perpendicular to the longitudinal axis of the crystal. Another aspect that must be mentioned is the small size of the flakes obtained. Many of them, as can be seen in Fig. 16.10, are less than 2 cm long. In some cases, they originated from supports that were also small, albeit there are supports in the collection that could easily provide larger flakes. The question arises here as to reason for the choice of small supports
and small flakes. Considering that among the artefacts there are several that show signs of having been mounted on handles, could it be then that what we have is an industry directed towards producing compound artefacts elaborated by articulating different materials like wood, bone and stone? As we will see in the case of the Coqueirinho site, there are various elements present that favour that hypothesis.

In other archaeological collections with an expressive presence of quartz, similar characteristics to those identified above can be observed. The production of very small flakes and the intense exploitation of cores, whereby they are reduced to small cubic or sub-globular forms, have been described for the early Holocene occupations
of the Bibocas II site, in Jequitai (São Francisco River basin in the north of Minas Gerais) (Bassi 2012) and also for the Diamantina region (in the hills that divide the São Francisco and Jequitinhonha watersheds in the central-northern part of Minas Gerais) (Isnards 2009). Bassi undertook an extensive, detailed analysis of quartz knapping methods at the Bibocas II site and showed that, contrary to what the literature suggested (Prous and Lima 1986/90), the quartz crystals can be addressed in many different ways and that multiplicity is characteristic of the Bibocas II site. The lesser diversity of methods identified for Lagoa Santa collections must therefore be the result of choices made by the stone knappers themselves and do not stem from any limitations imposed by the morphology of the quartz crystals. However, it must be taken into account that the analysis of Bassi referred to all the remains of the site collection, while in Lagoa Santa, the assemblage analysis was only a partial one, and so it is not possible to eliminate the possibility that the lesser diversity encountered is a reflection of the sample criteria.

One last feature of the Lagoa Santa industries that must be mentioned is the use of varied angles to make full use of the supports. In both the flakes and the artefacts and cores, regardless of the support involved, we have observed recurrent use of all the flat surfaces whether their angles favour knapping or not. That attitude is usually interpreted as a strategy designed to economize the raw material by exploiting it to the maximum until it can yield no further flakes. Its behaviour has been correlated with places or contexts where there is restricted access to the raw materials, either because of the distance or other accessibility restrictions. In the case of Lagoa Santa, however, none of those explanations is applicable because there is an abundance of widely dispersed crystals, making it difficult to imagine that there could have been any social control over their use. That being so, the apparent contradiction between an economizing behaviour and the ready availability of the raw material is a question entirely open to discussion.

The same contradiction between the intense and extended exploitation of the cores and the abundant presence of raw material in both regions, especially quartz, is also apparent in the cases of Diamantina and Jequitai (Bassi 2012). In Diamantina, in particular, the quartz crystals, some of them of well over 10 cm in size, were abundant up until the twentieth century, when crystal mining began in the region. The Bibocas II site is only a short distance from a large, active quartz mine (Bassi 2012). The phenomenon appears to be recurrent, and comparative analyses among the regions, taking into account the specificities of their contexts, could be very productive for gaining a better understanding of the stone knappers’ behaviour.

We used the same methodology applied to the Sumidouro site material for the collection formed by lithic remains coming from the interventions at the Coqueirinho site. Although there were fewer interventions at the latter site, the collection is considerably larger and 385 remains were collected. Some of the basic data concerning the lithic material from that analysis are set out in Figs. 16.13, 16.14, 16.15, 16.16 and 16.17.²

²See Bueno (2012) for details of the methodology adopted.

³See Bueno (2010) for a more detailed discussion of the Coqueirinho site lithic assemblage.
Fig. 16.13  Distribution of lithic raw materials in 10 cm levels at Coqueirinho site

Fig. 16.14  Distribution of lithic remains categories in 10 cm levels at Coqueirinho site

Fig. 16.15  Size of lithic remains size in 10 cm levels at Coqueirinho site
The Lagoa Santa Collection in the National Museum/Federal University of Rio de Janeiro (UFRJ)

To complement the activities involving the lithic collections of the Lagoa Santa region, we made a technical visit to the National Museum in Rio de Janeiro to assess the situation and potential of the Lagoa Santa collection of lithic remains. During our stay at that institution, we were given access to the entire collection which embraces many sites in the region that were excavated during the twentieth century by different researchers, including those of foreign missions. It is worth mentioning that within that collection, there are remains originating from emblematic sites like the Lapa Vermelha IV and the Cerca Grande complex.

The lithic remains from the Lagoa Santa region in the archaeological collections of the National Museum (UFRJ) encompass specimens originating from various
sites investigated by many different researchers of various institutions and formed in different periods. Among them, for example, there are collections formed at the beginning of the century by Padberg-Drenkphol, another stemming from the archaeological mission coordinated by Wesley Hurt, who, with the collaboration of Oldemar Blasi, conducted intense excavations at Cerca Grande in the mid-twentieth century, and, indeed, the material from those excavations accounts for 60% of the entire collection. There is also the collection of material excavated by the Franco-Brazilian mission coordinated by Annette Laming-Emperaire, who, in the second half of the 1970s, conducted systematic work in the region and exhaustive excavation of the Lapa Vermelha IV site.

It was not possible to calculate the total size of the collection, but there are 20 boxes accommodating thousands of lithic remains. During the time one of us (LB) was at the institution, the natures of the contents of all the bags of material were verified in all the boxes to acquire an overall view of the collection and assess its potential for a more detailed analysis in the future. In general, there is a notable predominance of hyaline quartz represented by the products of unipolar knapping of quartz crystals. One aspect that stands out is the poor representation of any indications of bipolar knapping, an aspect that was identified in the analysis of the lithic remains stemming from the sites excavated by the Origins project. Obviously that aspect needs to be investigated in greater detail and quantified, but generally speaking, there are very few flakes or fragments that can be associated to bipolar knapping.

Given the huge size of the collection, the low representation of projectile points is also surprising. Even though this lithic industry has traditionally been classified as simple or expedient, there are references in the literature to the presence of points of various sizes (Hurt and Blasi 1969; Walter 1958). In the case of this collection, we only managed to identify five artefacts of that kind, all of them made from hyaline quartz flakes (Fig. 16.18). Another kind of remain consists of very small globular hyaline quartz cores, proof of intense utilization of that material and taking advantage of supports in various directions and angles, permitting the production of innumerable tiny flakes. This last feature is recurrent in the collections, that is, a predominance of very small remains despite the existence of much larger supports, even when the supports are actual crystals (Fig. 16.19).

Yet another category identified in the same collection is that of polished axe blades. We identified two such blades, both from the Cerca Grande 6 site (Fig. 16.20). One of them is very well polished and produced on a limestone support came from area B, test pit 1 of the units 3–4, level 4. The dating for level 3 is around 9,000 years BP (Hurt 1960). Thus, in a similar way to what we found at the Lapa do Santo and at the Lapa das Boleiras, this and perhaps one other blade found at Cerca Grande 6 (but for which we do not have a stratigraphic reference) are indicators of the knowledge and use of polishing techniques in the fabrication of lithic artefacts at least 9,000 years BP. That raises a series of questions, which only two of them we will examine here. Why was it that the practice was not disseminated and did not lead to an intensification of the production of that kind of artefact practically until 2,000 years BP, which is when we start to identify that kind of artefact more frequently in
Fig. 16.18  Projectile points in hyaline quartz. Lagoa Santa Collection. National Museum/UFRJ (Photo by Lucas Bueno)

Fig. 16.19  Knapped hyaline quartz crystal. Lagoa Santa Collection. National Museum /UFRJ (Photo by Lucas Bueno)
the archaeological record? Could the presence of this kind of artefact, usually associated to the felling and trimming of trees, be an indicator of forest management? 4

The assemblage of remains we have described would be more than sufficient to indicate the potential of that collection, even considering the scarcity of primary information. Even so, there is yet another kind of remains that boosts its potential even further. We identified a series of artefacts produced from flint flakes, some of which are plano-convex (Fig. 16.21). This category is unprecedented in the collections studied so far and introduces new elements for discussion regarding the organization of the lithic technology associated to the occupation of rockshelters in the region. For this particular category of remains, the stratigraphic data indicate an association with layers dated at least 9,000 years BP.

Putting all those elements together, what we can discern for the Lagoa Santa region is a scenario of intense occupation, in which both standardization and variability occur. If we only take a quick look, all the sites seem to present the same general aspect, namely, thousands of flakes of hyaline quartz produced by unipolar knapping of quartz crystals and used in their crude state or with very little secondary modification. However, in the midst of that scenario of apparent homogeneity, certain elements stand out that are important insofar as they enable a characterization of greater diversity. They are the polished artefacts found in very ancient strata (a relatively rare occurrence for the older lithic industries in Brazil); the presence of formal, bifacial artefacts (including projectile points) and formal unifacial artefacts; and the presence of raw materials from outside the karst area. Another extraordinary aspect is the sheer magnitude of the collections with many of the sites generating samples of thousands of pieces. That means the region was intensely occupied with

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4It should be remembered that polished blade artifacts may have had other uses apart from felling trees. They could be used to produce sculpted items (canoes) or to extract materials like honey from hollows in trees.
variation in the activities and possibly in the roles played by the sites themselves, which were articulated in much wider system of occupation that most certainly involved areas beyond the karst itself. The composition of the overall set of artefacts shows the combined use of different strategies for obtaining, circulating, and producing lithic artefacts, articulating techniques such as unipolar and bipolar knapping and polishing as well as the production of unifacial and bifacial artefacts. Underlying an apparent homogeneity, there is a significant diversity that probably corresponds to the application of differentiated strategies and performances, and in that articulation lies the key to understanding the choices that guided the production of this lithic assemblage.

A Simple Industry?

As we pointed out in the brief historical outline at the beginning of this chapter, in most of the published works consulted, the same aspects of the Lagoa Santa lithic assemblages are repeated, namely, (1) the remains are predominantly flakes and fragments of hyaline quartz resulting from knapping, (2) in some sites polished axe blades appear, (3) formal artefacts are practically absent, and (4) most of the sites
indicate the absence of significant modifications in lithic technology in the entire extension of the stratigraphy.

As we have pointed out in the first section of this chapter, that description and the interpretations stemming from it give an impression of synchronic and diachronic homogeneity in the Lagoa Santa lithic industry. However, we have clearly shown, in the characterization of the lithic material from a few of the sites (Lapa do Santo, Lapa das Boleiras, Cerca Grande, Coqueirinho, Sumidouro), the existence of diversity, at least in the composition of the artefacts assemblage. There are polished artefacts that date back to the early Holocene; there is a production of formal bifacial and unifacial artefacts; there is the use of materials that are exogenous to the karst; sometimes, on the same core, there are signs that a combination of unipolar and bipolar knapping techniques was used; and, lastly, there are significant differences among the compositions of the artefacts assemblage produced from site to site (among the sites analyzed). This last aspect can be seen, for example, between the assemblages from Lapa do Santo and the Lapa das Boleiras (as discussed by Araujo and Pugliese 2010).

While all those points are important and deserve to be highlighted (see Bueno 2012 for a detailed discussion of each one), the question of raw material deserves special mention. There seems to be a consensus among the researchers that the most abundant raw material in the collections, and the one that is most readily accessible locally, is quartz in its hyaline or milky forms, and its main sources are in the vicinity of the town of Pedro Leopoldo in outcrops on the crystalline basement, or in the form of pebbles along the terraces of the Rio das Velhas river (Prous et al. 1998). We do not have a systematic inventory available for the other raw materials, but the information that is available indicate the following distribution: (1) amphibolite and other resistant rocks were probably collected from the Ribeirão da Mata stream to the north of Pedro Leopoldo; (2) compact hematite was brought in from the iron-ore bearing region of central Minas Gerais (Quadrilátero Ferrífero); (3) sillimanite was obtained from Conceição do Mato Dentro or from the upper Jequitinhonha river; (4) quartzite plates would have come from the Serra do Espinhaço (or even from Santana do Riacho itself); (5) the quartzite pebbles could be from the terraces of the Rio das Velhas River; (6) the jasper and the chalcedony are of uncertain origin but are probably from more than 60 km away (Araujo and Feathers 2008; Prous 1991a; Prous et al. 1998); and (7) the silexites, whose closest known source up to this moment is to the southwest in the region of the upper course of the São Francisco River (Koole 2008).

Another important point stemming from the general characterization set out in this chapter concerns the size of the lithic collections from each site. It is important to understand that the numbers are directly related to the intensity of the interventions and the dimensions of the sites, but, generally speaking, we can say that there is an enormous quantity of lithic remains that were produced during the occupations of the karst and that there are tens of thousands of remains in each one of the rock-shelters that were occupied. To that we can add two other important considerations that characterize the technological system in that area: (1) there is an important
association between those lithic remains and the human burials, and (2) there is no
evidence of any direct spatial association between the remains of human activity
and the fossils of megamammals that occupied the region in that period (Hubbe
et al. 2013).

According to the delineated characterization, we can say that the Lagoa Santa
lithic industry, when contrasted with the expectations stemming from theoretical
aspects, presents a most unusual situation. While, on the one hand, there are ele-
ments that corroborate the idea of a very simple technology, given the use of local
materials with little secondary transformation of the supports, on the other hand,
there is a production of formal artefacts, use of exogenous raw materials, intense
utilization of the local raw material, and, even though it was locally available, we
could say that there existed both a supply and a “stockpiling” of raw material in the
rockshelters, where there is evidence of continuous reoccupation. Moreover, the
way the main material in the local environment, hyaline quartz, was appropriated is
indicative of a strategy to make the very most of the material, with cores being
knapped down to the limit using a combination of different techniques and showing
the existence of refined knowledge of the nature of the raw material, how to handle
it, and how to obtain the maximum possible production of small-sized flakes. In
other words, despite its abundance and availability, the hyaline quartz was intensely
exploited, a combination of characteristics that has often been presented as “antago-
nistic” in the research into the organization of lithic technology (Andrefsky 1994;
Nelson 1991; Shott 1996). To gain an understanding of that configuration, we pro-
pose that the combination should be understood in a contextual framework. This
proposal is also intended to reinforce the idea that concepts such as simplicity or
expediency and curated have been used on many occasions much more to describe
than to explain (Shott 1996). Those concepts should operate heuristically to orga-
nize and arrange the research and our questions and not as closed, uniform concepts.
Each local lithic assemblage should be reflected on and analyzed in the light of
those concepts, so that we can understand their specificities and singularities, and
on that basis, we will be able to discuss their meaning and their potential and achieve
a comprehension of the technological variability in a systemic perspective.

In that sense, the question, or questions, we select for discussion involve that
combination of intensive exploitation of the quartz and its local abundance and
accessibility, the immense quantity of remains, the spatial relation to human burials
and at the same time the association with the megafauna and the choice of deliber-
ately producing small flakes and artefacts.

Another important point to bring into the discussion, and one we have spoken
about in the chapter, involves the presence of partially polished axe blades in strata
associated to a very ancient period of occupation of the region. What we wish to
underscore here is not their aforementioned utilization but instead their production
and functioning. Regardless of their specific use, these artefacts were produced with
handles, which is evidence of the complementariness and knowledge of the use of
wood and stone, at the very least, in the manufacture of certain artefacts. We believe
that this point can help us to explain the preference for small supports and low

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intensity of secondary modifications when the option of larger supports was readily available. As one of us has argued on a previous occasion (Bueno 2012: 81):

our hypothesis is that the industry was marked by an overarching artifact assemblage in which compound artifacts played an important role. Small artifacts with a sharp edge, low degree of reworking, and signs of indirect handle show that they must have been used to compose artifacts mounted on wooden handles. The fact of the artifacts produced being small cannot be attributed to any physical requirement, scarcity, or form of the raw material. The maximization of the exploitation of the hyaline quartz does not stem from availability, access, or dimensions of the raw material. The production is the result of a deliberate choice, or rather of a series of choices that led to the production of artifacts with specific designs, which in turn were influenced by the selection of a given performance.

If we think about the quantity of lithic material found at the sites and the contexts of their deposition, especially regarding the other associated types of remains, then we can propose or at least sketch out hypotheses regarding the expected performances. Even though to date there have been no microwear analyses that might identify their function or the activities that those lithic materials were associated to, recent taphonomic analyses of various skeletons from the Lapa do Santo have found signs of removal of the flesh, in the form of fine, precise cuts in certain parts of the bones (Strauss 2010). To carry out such activities, and bearing in mind the powerful symbolism that would be associated to them, it would have been necessary to use precision artefacts with an active part characterized by well-defined cutting edges and a holding part that would ensure force and precision. The composition made up of small quartz flakes with a single cutting edge and some indirect way of holding them made of wood or bone is a combination that meets that need perfectly well.

Such use of micro-artefacts to elaborate compound artefacts to be used in activities of scarification and symbolic and ritual activities was presented on several occasions in papers reporting work carried out in Australia in the twentieth century (Robertson et al. 2009: 297). However, a recent revision presented by Robertson et al. (2009) and Hiscock et al. (2011) makes that hypothesis difficult to sustain at least from the point of view of Australia as a whole, and currently it is giving way to a hypothesis whereby those micro-artefacts used to manufacture compound artefacts would be used in a variety of ways, including domestic uses as well as in ritualistic and productive activities. According to Robertson et al. (2009: 298):


That could well be the case for Lagoa Santa, but, once more taking into account the local context and the associations among the various types of remains that make up the archaeological record of the sites in that area, then that hypothesis of the use of such artefacts for the preparation of bodies for burial deserves to be tested, at least for the period of the early Holocene. A good first step in that direction would be to make a more detailed and comparative analysis to identify whether the cut marks identified on human bones are compatible with the cutting edges of possible lithic artefacts and to include in that activity analyses of microwear associated to the artefacts’ use.
Perhaps the most important point to be made here is how essential it is to create or at least seek for contextual explanations that might help us to understand the characteristics of each industry and the choices that guided them, that orientated them and, from the broader point of view, are linked to defined performances desired to be achieved by the people who manipulated this material, who selected the raw materials, who defined how they should be approached, what should be produced and how and for what purpose they should be used (Bueno 2007).

Defining industries as simple, complex, curated or expedient is indeed a research strategy, but, on its own, it fails to explain and does not inform us of their possible meanings. One last point worth mentioning concerns the technological variability of the lithic assemblages associated to sites in rockshelters and in open air.

Analyses and comparisons among four sites in the Lagoa Santa karst, two in rockshelters and two in open air, enabled us to verify the existence of variations in the composition of the overall artefacts assemblage at each one of those sites. They are indicative of the execution of different activities and of different spatial associations, especially regarding possible connections among sites within and outside of the karst area. According to Bueno (2012: 80):

we can propose the hypothesis that the rockshelters played the role of agglutinating locations and references for the persistent occupation of the karst, around which a variety of activities recurrently took place, leading to the setting up of small ephemeral camps. In that way, the rockshelters would represent the focal locus for marking the occupation of the karst area and would be the first or primordial point of extra-local connection, whereas the open-air sites gravitated around the rockshelters, articulating them with the locally available resources. That model is also compatible with what has been seen earlier regarding the differential variation among the site categories. The open-air sites show greater variation among them insofar as they would have been related to carrying out specific activities designed to obtain certain resources, while the shelters would congregate a diversity of relatively regular activities.

Conclusion

In the light of all that has been set out above, we have to say that the lithic technology of Lagoa Santa continues to be largely undefined. What we can state, however, is that the image of a simple, homogenous lithic industry of little interest is no longer sustainable. Furthermore, characterizing an industry as curated or expedient, in addition to not explaining very much, should not be the objective of our research if we really want to understand the cultural choices that guided the production of the artefacts assemblage that has been analyzed.

The Lagoa Santa lithic industry seems to be a highly emblematic case of the selection of local raw material to produce artefacts that require a specific design—compound artefacts mounted on handles of wood and/or bone. Here we have put forward a hypothesis for the functionality of those artefacts elaborated on the basis of their deposition contexts. However, we must also point out the need to test that hypothesis and to keep open the possibility of working in a perspective that admits

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that the artefacts may have been multifunctional in the way that has been discussed in Australia (Hiscock et al. 2011; Robertson et al. 2009). Furthermore, it is important to draw attention once more to the question of raw materials, because the presence of exogenous raw materials and of artefacts produced by other operative sequences with other forms and other compositions of active and prehensile parts indicates distinct functionalities and the integration of the karst with more widespread external areas, either through circulation or contact, or the effective use of a more extensive area as we have discussed on other occasions (Bueno 2010, 2012). Thus, far from being a simple industry, what we see is a technological organization that integrates different areas, the circulation of raw material, the combination of different techniques in exploiting those raw materials and the production of artefacts with diversified uses and meanings, constructing a mosaic of choices that define the uniqueness of that industry.

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