THE CONTRIBUTION OF STUDIES OF ACQUISITION AND USE OF RAW MATERIALS IN ARCHAEOLOGICAL CONTEXTS

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The study and determination of the origin and the chemical and physical characterization of the raw materials is usually associated with the study of the provenance of prehistoric lithic raw materials (Rapp & Hill, 1998). The advances in different scientific disciplines such as physics, chemistry, biology and technology in general of the first half of the 20th century allowed diverse analytical techniques to be used in the characterization of the chemical and physical structure of materials with a high degree of accuracy. New methodologies to analyse the nature of different materials were incorporated in the archaeological practice and thanks to it, innovative questions could be made, and others, until then in the field of speculation, could now have an answer.

With these new methodologies, a new discipline was born – *Archaeometry* – which can literally be translated as "measures linked to archaeology". This field of study is associated to the emergence in 1958 of the eponymous magazine, *Archaeometry* and to the type of articles published here focusing on the physical characterization and chemical composition of archaeological remains, leaving aside other subjects such as Botany and Zoology. Another new magazine would supress this gap: the Journal of Archaeological Science in 1974. The definition of Archaeometry varies depending on the chapters of the first of these magazines. Even though very criticized, one of the most accepted definitions is the one by Aitken (1961) "measurements made on archaeological material" and a more complete by Olin (1982) saying "application and interpretation of natural science data in archaeological and art historical studies". Currently this discipline addresses issues such as dating methods, physico-chemical analysis (including the technological processes of manufacturing, origin and use), paleoenvironmental studies, geophysical surveying and spatial teledetection and also the mathematical and statistical methods.

Since 1980 we are witnessing a democratization of the use of Archaeometric techniques in archaeological studies, applied on different materials such as lithics, ceramics, metallic and osseous materials. Currently the use of these new methods is essential to answer new questions related with the origin and use of objects (Malainey, 2011). Even though these studies are in large expansion, the analyses are still frequently made on materials considered to be exotic in a specific archaeological context. There are a couple of reasons that explain why raw materials procurement studies are more common in prehistoric contexts. The materials to be studied are more sporadic and for this reason there is an attempt to take the most information possible out of the less quantity and variety of materials. This is why lithic raw materials procurement studies had a big theoretical and practical framework developed for the study of prehistoric contexts. Now this framework is being adapted to the study of different raw materials from other chronologies and contexts. Nevertheless, the use of archaeometric techniques on more common remains that give us information about the daily reality of the people who created them is more widespread.

The studies of procurement and use of raw materials present in a collection are not limited to the study of prehistoric lithics. The technical questions are: What materials is it made of? What are its physic and chemical properties? Where is it originally from? These questions can be applied to the study of any archaeological context and all materials such as ceramics, metals, glass, liquids, fabric and bone among other organic and inorganic materials. Also theoretical questions related with the cultural development transcend the temporal scope: how was the resource exploited? Why a given raw material was used instead of another? A diachronic dialogue allows a better understanding of the exploitation and use of raw materials in space and time which is essential to understand the extension of strategic thought and the cultural motivations in contrast with technological development. The discussion of techniques, data and results feeds the discussion on the limitations and capacities of the analytical techniques applied in archaeological contexts.

Some methods and techniques more widely used are:
- Thin sections of archaeological materials: possibly the first method to be used that consists in making a thin section of less than a 0,1 mm of thickness placed in a glass slide in order to allow the passage of light. With the help

of a microscope we can analyse de mineralogical and crystallographic composition of the sample. Mainly it gives information about the size of the minerals present, its saturation and distribution.
- X-Ray diffraction (XRD): an X-ray is made successively in increasing degrees (0°- 90°) on a sample of material fine grained and homogenized to determine an average composition. Depending on the diffraction of the sample it is possible to identify both the mineral and its mineralogical stage.
- X-Ray fluorescence (XRF): this technique allows the identification of the elements present in a sample, giving its complete composition. When done after a thin section it shows the trace elements not visible on a microscope.
- Particle-induced X-Ray emission (PIXE): It is a non-destructive technique where the sample is exposed to an ion beam. The atomic interaction gives off on the x-ray a wavelength part of an electromagnetic spectrum specific to an element.

Because raw material studies are in a moment of expansion, in this session we aimed at gathering students that focus on the problems related with the origin and use of different raw materials, using distinct techniques and methodologies in the hopes of establishing a debate about techniques applied, results obtained and contexts interpreted without a chronological limit. Questions that transcend any temporal limit are, for example, "what properties are we looking to analyse for each raw material?", "when is it legitimate to use destructive techniques?" and finally, "what is the importance of studying the origins, exploitation and use of raw materials?".

The nature of the presentations of the session are in agreement with the stated above about the ongoing archaeological tradition of associating raw material procurement studies to the prehistory and the study of lithic collections. Some limitations that were pointed out during the session were the costs of the analysis and the lack of preparation in the commonly called hard sciences such as physics, chemistry and even geology and geochemistry by archaeologists. There is still a long way to go. Usually analytical studies are associated with bigger projects that have the resources needed to pursue these studies and there is a new generation eager to invest in both formation and the study of the archaeological record based on innovative resources of analysis.

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