



About fires and paintings: Three stratigraphic insights on the history of a cave with prehispanic rock art



Lucas Gheco^{a,*}, Marcos Gastaldi^b, Fernando Marte^c, Marcos Quesada^d, Marcos Tascon^c, Noemí Mastrangelo^c

^a Centro de Investigaciones y Transferencia Catamarca, Consejo Nacional de Investigaciones Científicas y Técnicas, Universidad Nacional de Catamarca, Prado 366, San Fernando del Valle de Catamarca, Provincia de Catamarca, Argentina

^b Instituto de Antropología, Consejo Nacional de Investigaciones Científicas y Técnicas, Museo de Antropología, Av. Hipólito Irigoyen 174, Córdoba, Provincia de Córdoba, Argentina

^c Instituto de Investigaciones sobre el Patrimonio Cultural, Universidad Nacional de San Martín, B. Quinquela Martín 1784, Ciudad de Buenos Aires, Argentina

^d Centro de Investigaciones y Transferencia Catamarca, Consejo Nacional de Investigaciones Científicas y Técnicas. Escuela de Arqueología, – Universidad Nacional de Catamarca, Prado 366, San Fernando del Valle de Catamarca, Provincia de Catamarca, Argentina

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ABSTRACT

How to connect rock art with the social practices developed around it along time? Trying to answer this question, in this paper we propose a method to link three different approaches that share the same stratigraphic principle: the excavation of the cave's floor sediments, the confection of a Harris' matrix of the painting process of one of the panels with rock art; and the study and further chemical analysis (SEM-EDS and Raman) of micro samples taken from the figures painted and the rock underlying. The potential of every single approach is multiplied by the interconnection given by the discovery of small layers of carbonization in the cave's walls as a result of several combustion events (hearths) done inside the cave. It must be highlighted, that this crucial information was obtained by using a novel methodology previously developed by the group of authors (Tascon et al., 2016). It allowed us to identify and chemically characterize superficial as well as underlying soot layers. Besides, the combination of this piece of information with other archeological evidences was vital to obtain a holistic view of the historical process developed at the caves of Oyola's archeological site, in the Argentinean northwest. Despite this is a case of study, the potentialities of this methodology can be spread out into other shelters with similar characteristics.

1. Introduction

In the archeological studies of rock art exist some difficulties to understand the historic process that shaped and transformed panels with paintings or engravings in their relation with the other social practices carried out in those spaces at the time. Even though stratigraphy is one of the main archeological methods to establish temporary sequences of activities (Carandini, 1997; Harris, 1991; Roskams, 2003; Russell, 2000), its application into certain fields of the archeological record still represents an issue; such as the case of caves with rock art. The first problem of using stratigraphies in shelters with rock art is that in many places there are not stratified sediments to perform an excavation. In the cases that there are, and diggings are carried out, other problems arise regarding the link between findings and strata in the floor with the paintings on the walls. One way to solve these problems is the localization of small rests of pigments in the floor strata or

sometimes little-painted rock fragments detached from the walls (Aschero, 1988; David et al., 1994). In these situations, mostly exceptional, the difficulty lies in recognizing what kind of paintings correspond to those pigments, in order to avoid linking together all the figures from the wall with the stratum where the rests fragments were found.

In other cases, sequences of rock paintings are built by the stylistic study of the motifs or, whenever exist, using the overlapping between figures to create stratigraphic matrixes of the painted panels (Chippindale and Tacon, 1993; Loubser, 1984; Russell, 2000). Nevertheless, in these situations, the observed historic processes of the walls are still disconnected from the rest of the activities inferred from the stratigraphic findings in the floor, what prevent a global vision of the events happened in those caves.

In this paper, we offer an alternative approach to address some of these problems that resumes, combine and complements other valuable

* Corresponding author.

E-mail addresses: gheco@hotmail.com (L. Gheco), fmarte@unsam.edu.ar (F. Marte).

methodological and technical developments done by different researchers (David et al., 1994; Russell, 2000; Steelman et al., 2002). For this matter we propose the application of three related approaches which, beyond the differences, have in common the use of stratigraphic principles: 1) stratigraphic excavation of soil sediments of a cave following Harris' (1991) guidelines; 2) micro-stratigraphic study of small samples of rock art for optic and petrography microscopy, and underlying stratum combined with chemical analysis by means of micro-Raman spectroscopy and scanning electron microscopy with elemental analysis by energy dispersive X-ray spectroscopy (SEM-EDS); 3) the confection of stratigraphic sequences of the panels with rock paintings from the studied overlays and stylistic characteristics of the paintings.

Each of these approaches has its own possibilities and limitations to achieve a comprehensive knowledge of the social practices done in the shelters with rock art. Each one has been used widely with valuable results in the study of paintings and engravings (Chippindale and Tacon, 1993; David et al., 1994; Loubser, 1984; Rogerio Candellera, 2014; Russell, 2000; Steelman et al., 2017). But, as we propose in this paper, their interconnection improves the advantages and allows us to get a global vision of the historical process (Pauketat, 2001) carried out in those places, possible to be complemented –in future studies– with the direct dating techniques applied to rock art research (Bonneau et al., 2017; McDonald et al., 2014; Russ et al., 1992; Steelman et al., 2017; Troncoso et al., 2015; Whitley, 2013). In this paper, we demonstrate an alternative methodology to integrate these different stratigraphic perspectives through the discovery of different fire's evidence. Basically, it consists in the localization of small carbonization layers in the cave's walls and sediments, resulting from fires performed within caves along history. Therefore, connecting these events, along with chemical and dating information, a high amount of new information regarding the relation of the social practices with the wall paintings can emerge.

In fact, this work takes the methodology and conclusions proposed in a prior article from this group (Tascon et al., 2016), where we characterized chemically the paintings and soot layers at Oyola, and combine this valuable information with other archeological evidences such as the floor excavation, the stylistic and overlapping studies of figures and the micro-stratigraphic analyses of paintings. While in the first article we focus on the technical development of a method to distinguish, either superficial or underlying, black paints from soot deposits, in this opportunity we use this protocol to obtain complementary information to connect the history of production of the rock art panels with other activities performed in the cave at each time.

As a case of study, the methodology hereby showed was applied to one of the most important caves with rock art in the archeological site of Oyola (Cave 7), located on the hills of *El Alto-Ancasti* of the Province of Catamarca, in the northwest of Argentina. We believe, however, that results and methodological articulation we have applied may be an example for any other different shelter with rock art with similar characteristics.

2. The archeological site of Oyola

The archeological site of Oyola is located nearby the homonym community, in the east side of the *El Alto-Ancasti's* mountain at the Catamarca province, in the northwest of Argentina (Fig. 1). First reports of this site were from some descriptions made by Amalia Gramajo and Hugo Martínez Moreno (Gramajo and Martínez Moreno, 1982, 1978), who in the second half of the past century had documented eight shelters with rock art within a batholith or circular pluton of 2,5 km of diameter. Caves and shelters are set at the base of big granite rocks immersed in a deep wood in the hill, near current Oyola town (Fig. 2, a and b).

Since 2009, our team has been conducting archeological research on this site. After several years of prospecting the area, we have documented 30 new shelters with paintings and engravings (Gheco, 2017,

2012; Gheco et al., 2013; Quesada and Gheco, 2011) which, together with the other eight described by Gramajo and Moreno, make a total of 38 caves and shelters with rock art. Despite of this fact, there may be still some more caves and shelters with rock art immerse into the deep forest.

In the Oyola's caves there are a great diversity of zoomorphic, anthropomorphic and geometric motifs, in white, red and black color (Fig. 2, c and d). For a long time all these paintings, as well as the rock art in all the mountain, were attributed to *La Aguada* culture, according with similarities between some of the painted and engraved motifs with the characteristics designs of the pottery from that culture (De la Fuente, 1979a, 1979b; De la Fuente et al., 1983; De la Fuente and Arrigoni, 1975; De la Fuente and Díaz Romero, 1979, 1974; Gordillo et al., 2000; Gramajo, 2001; Gramajo and Martínez Moreno, 1982; Nazar et al., 2012). These social groups inhabited the *valliserrana* region of northwest Argentina in the second half of the first millennium of the Christian era (approx. 500–1100 CE). They shared diverse political, economic and ideological aspects, standing out a relatively similar iconographic repertoire embodied in ceramic objects, stone sculpture and rock art (González, 1998, 1977).

Nevertheless, from different studies we have detected some indicators that allow us to think that these caves with rock art in Oyola, far from being a homogeneous group representing a unique moment, are the result of multiples painted events in a period of time that, we suspect, may comprehend centuries before and after *La Aguada* culture. The great diversity in the styles of the paintings, the overlapping of motifs, the heterogeneous chemical composition of pigment mixtures, among others, support the definition of these shelters with rock art as the outcome of a process of adding motifs along time, transforming and giving a whole new meaning to the panels in each different period of time (Gheco et al., 2013; Quesada and Gheco, 2015).

In this paper, we will be focus on cave Oyola 7. This shelter is at the base of a large granite rock, situated in the highest place of one of the numerous hills that characterize the landscape of the zone. Its interior is 14 m long, 4 m width and 1,6 m tall, what makes it one of the biggest caves of the place. After a few years of comprehensive surveys, we have documented 75 rock art motifs in the walls and roof of the shelter, made in white, black and red colors (Gheco, 2012). The presence of a ground with stratigraphic deposited sediment that could be excavated, plus the numerous chemical and stylistic studies made on the shelter's paintings, gave us the impulse to choose this cave to develop the following study.

3. Materials and methods

The different techniques of analysis that we outline in this paper share, as the main basis, the use of stratigraphic principles. This method, initially developed in the field of geology, supposes that order in the layers (sediments, paintings or pigments strata) reflects the sequence of the events of deposition/application that created them. In this way, the older layers or strata are, generally, stratigraphically set beneath the younger ones, which allows not only to give a relative order to the strata but also to give a sequence of the activities done at this place, inferred from the findings documented in every single one.

Despite the common emphasis on the stratigraphy, each of the procedures used in this paper has very particular technical and methodological characteristics, which will be briefly described in the next subsections.

3.1. Stratigraphic digging of Oyola 7 ground

For digging Oyola cave 7 ground, we followed the archeological stratigraphic principles mentioned by Edward Harris (Harris, 1991) and the proposal of the Museum of London Archeological Services (M.O.L.A.S.) for the register and description of stratigraphic unities (Harris et al., 1993; Spence, 1994). In this digging method (Bibby, 1993; Carandini, 1997; Roskams, 2003), the fundamental unities of

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