

ON-SITE AND POST-SITE ANALYSIS OF PICTOGRAPHS WITHIN THE SAN PEDRO VIEJO DE PICHASCA ROCK SHELTER, LIMARÍ VALLEY, NORTH-CENTRAL CHILE

by

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ABSTRACT

The San Pedro Viejo de Pichasca rock-shelter, located some 70 km east of the provincial town of Ovalle in the Limarí Basin is considered one of Chile's most important prehistoric sites with human occupation evidence dating to at least 9000 BCE. The rock shelter in the foothills of the Southern Andes Mountains is in a semi-arid environment. Since the 1960s there has been much archaeological interest with major excavations occurring between 1960 and 1970 (e.g. Ampuero and Rivera 1971). As part of a detailed survey of the rock shelter walls, many prehistoric painted pictographs, have been discovered and recorded, probably dating to the late Holocene. In July 2013 an Anglo-Chilean/Argentinean team further explored the walls and ceilings of the rock-shelter in order to experiment with different photogrammetric recording techniques, including microscopy and post-site digital analysis. This paper gives a synopsis of the long archaeological history of the site, along with observations and analysis of a number of selected painted panels that are located within the central section of the rock shelter. The various methodologies employed assisted in further understanding the underlying reasons that would have led people to paint in this rock-shelter.

ROCK ART DISTRIBUTION

As part of a long-term ongoing research programme, the authors have been engaged in a survey of the walls and ceiling of the San Pedro Viejo de Pichasca rock-shelter. This impressive natural feature is located within the upper section of a limestone valley overlooking the Hurtado River (Figure 1).

The semi-arid north of Chile (30° to 32° lat. S.) has one of the densest rock art concentrations in the Southern Cone, the southernmost area of South America, south of the Tropic of Capricorn. Previous studies have proposed a sequence of 3,000 years of production, from the hunter-gatherer societies of the Late Holocene (ca. 2,000 BCE) until the incorporation of farming societies into the Inca state (1450-1540 CE). Although paintings and engravings created by farming societies are the most common in this region, there are many pictographs that are associated with hunter-gatherer communities; one of these sites is the San Pedro Viejo de Pichasca rock shelter (Figure 2).

This large natural feature is 75 m long, 9 m deep, and stands around 1020 m above sea level (located at 30° 21' S, 70° 52' W). It is located in a deep V-shaped upland ravine that drains surface and stream water into the Hurtado River, the main hydrological course within the region (Figure 3). The rock-shelter is formed within a limestone area. However, regionally the solid geology comprises andesites and volcano-sedimentary pyroclastic rocks with intercalations (Aguirre and Egert 1965). The ceiling and wall surfaces are formed of a laminated limestone and in areas where fire has been in use, painted fragments of limestone have flaked off, and been subsequently buried within the later occupation floor. The bedrock of the rock-shelter is of Upper Cretaceous age belonging to the Viñita formation (Ampuero

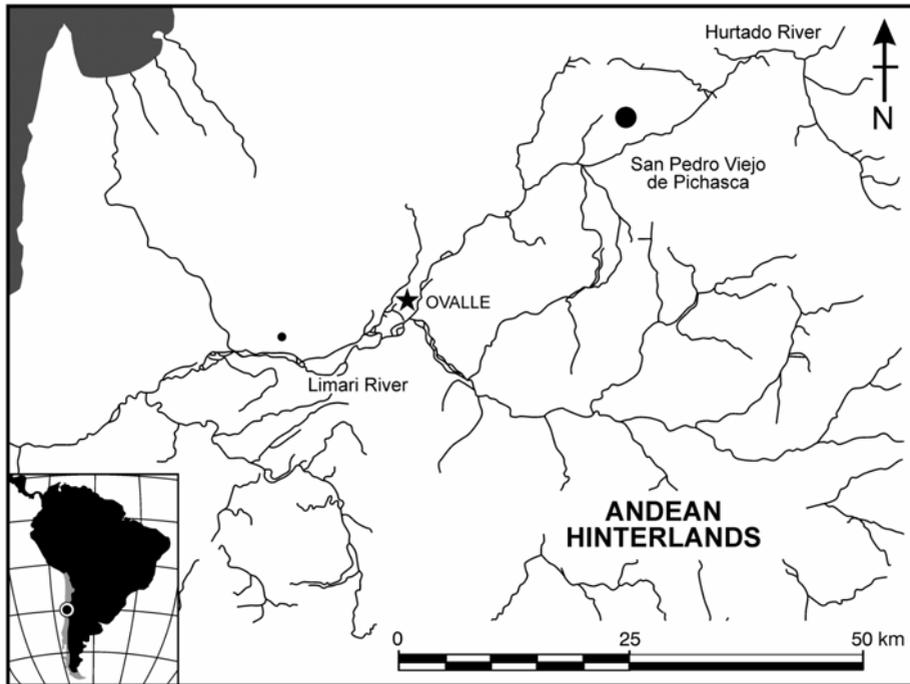


Figure 1. *The location of the San Pedro Viejo de Pichasca rock shelter.*
 Drawn by Abby George.

and Rivera 1971). The rock forming the ceiling is partially constructed from a porphyric vein which is more mechanically and chemically resistant than the overlying sandstones and shales (lutitas) that form the upper section of the side valley.

The rock art of the southern Andes is diverse in subject matter, style and location; the majority is recorded as open-air engraved rock art on static rock outcrop panels and large boulders. Engraved imagery includes anthropomorphic and zoomorphic figures as well as many geometric forms. The method of production includes a number of techniques such as pecking and scratching and is not too dissimilar to prehistoric counterparts in later prehistoric Europe and elsewhere. In some instances, painted images occur on vertical, or near-vertical, open-air panels with the preferred pigment being haematite, although other minerals were used, including copper ore. The images, comprising mainly symmetrical geometric and representational figures are painted in various hues of brown and red haematite. The mineral ingredient was probably locally sourced.

Covered rock art, either in caves or rock shelters, is similar, with haematite, manganese and charcoal being the principal ingredients for the production of pigments. The sourcing, ingredient mixing and eventual application to a panel can be considered part of a formalised package that includes the act of painting, in turn followed by viewing and interpreting (see e.g. Munn 1973).

Southern Andean rock art, both engraved and painted forms is distributed through the hinterlands and valleys that extend to the uplands and mountains of the Central Andes, usually

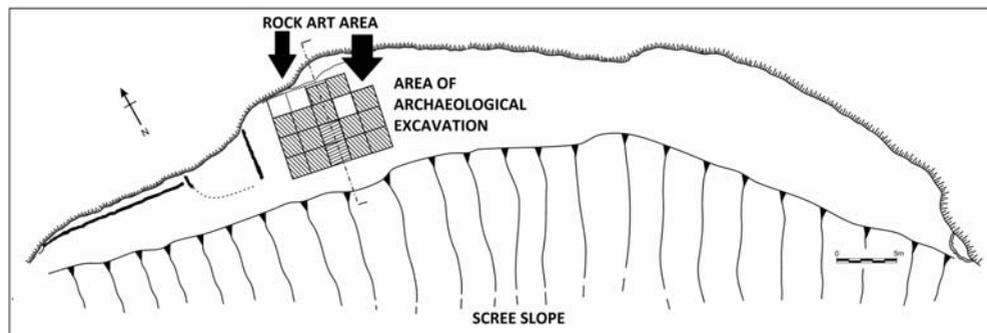


Figure 2. *Plan of the San Pedro Viejo de Pichasca rock shelter.*
Adapted from Ampuero and Rivera (1971), re-drawn by Abby George.

to a height of no more than 3,500 m above sea level. Chronologically, three main groups of prehistoric rock art have been recognised: hunter-gatherer art (referred to as hunting art), farming art (pre-Inca) and Inca art. The dating of the three groups is based on figurative and motif style, as well as comparison with rock art elsewhere and the analysis of significant image superimposition. However, these dating techniques can be considered sometimes too crude and open to challenge. In the case of the rock art within the San Pedro Viejo de Pichasca rock shelter, the dating of the panels has been partially assisted by the artefacts recovered from the various occupation floors exposed through archaeological excavation. However, it should be noted that the dating sequence is extensive and only an approximate period can be surmised for when these images were painted.



Figure 3. *The San Pedro Viejo de Pichasca rock shelter. The arrow shows the location of the painted rock art panels.*

Image: G.H. Nash.

The western section of the site was first investigated by Jorge Iribarren during the late 1940s and again during the 1960s (Iribarren 1949, 1967, 1970). Later, Ampuero and Rivera led extensive excavations at the end of the 1960s (Ampuero and Rivera 1971). These investigations

confirmed that the shelter was first occupied by early hunter-gatherer populations who were using macro-lithic and bone technology. The upper stratigraphic sequence revealed a complex pottery technology. Both excavation programmes identified the presence of red, yellow and green pictographs on the ceiling of the rock-shelter although no details or interpretation of these panels was given. Osvaldo Silva, Gonzalo Ampuero and Mario Rivera later returned to the rock shelter to specifically explore the walls and ceiling and as a result many new pictographs were identified, along with a burial. Results from the extensive excavations showed a near-continuous occupation of the rock-shelter; from probably seasonal hunter-gatherer use to sedentary farming. Investigations within the main floor area of the rock shelter have allowed archaeologists to establish a clear chronometric sequence that dates between ca. 9000 BCE and 600 BCE (Ampuero and Rivera 1971, Rivera 1995). During the final excavation season in 1975, all known pictographs were recorded by Lynch (1975) however, until now, no research on the character of this unique rock art assemblage has been undertaken.

Over the past few years, an intensive landscape investigation within the Limarí Basin has identified at least twelve pictograph sites, San Pedro Viejo de Pichasca being the most complex of the group. Although none of the painted panels has been directly dated, several authors have related them to hunter-gatherer societies, probably by those using the site during later prehistory (Ampuero 1966; Iribarren 1973, Troncoso *et al.* 2008). This conclusion is partly based upon three lines of evidence: firstly, similar motifs to those painted on the ceiling have been found on chronometrically-dated engraved animal bone (Punta Teatinos cemetery dated between 2000 to 100 BCE; Schiappacasse and Niemeyer 1986); secondly, pigment residues are persistently found within the stratigraphic sequence of nearby dated settlements and thirdly, similar paintings have been indirectly associated with hunter-gatherer settlements within the region (Troncoso *et al.* 2008).

THE ARCHAEOLOGICAL RECORD

Rock art research in central and northern Chile has in the recent past been summarised, albeit briefly, by Schobinger and Strecker (2001, 732). The focus of this chapter has been on the open air pecked engravings that are found across most of the hinterlands and valleys of the Central Andes, extending to the fringes of the Atacama Desert in Northern Chile. The engravings are varied and date from around 1000 BCE, represented by localised agro-ceramic cultures up to the 15th century when this tradition is adopted by the Incas. From this period the motifs used in constructing rock art compositions are also found on ceramics.

Excavations in San Pedro Viejo identified four occupational layers related to hunter-gatherer populations, which utilised the rock-shelter for up to 10,000 years. During this time span the site was frequently used as an occupation site although its initial use was for human burials.

The majority of the lithic assemblage is associated with hunting activity. A large number of diagnostic tools showed signs of retouching suggesting extensive reuse over a considerable period of time. Faunal remains, including *camelid*, probably Guanaco (*Lama guanicoe*) and limited *canid*, indicate that local resources were being exploited. In addition, invertebrate remains show probable contact evidence with populations located along the Pacific coast (Ampuero and Rivera 1971). Later occupation is also reflected in the remains of maize (*Zea mays*) and beans (*Phaseolus vulgaris*) which have been identified within the upper stratigraphy of the occupation floor of the shelter, along with the presence of pottery. Fragments of solidified red pigment, made from haematite have been found in various

stratigraphic layers, in particular within the upper levels of the shelter floor. Of particular interest and possibly associated with the static art is the discovery of a red painted mandible of a mammal however, this item was not provenanced.

THE ART OF SAN PEDRO VIEJO DE PICHASCA: CURRENT RESEARCH AIMS AND OBJECTS

In 2012-13, research was focused on the recording and formal analysis of the pictographs that occupy the ceiling of the shelter. This forms part of a much wider regional landscape survey that includes prospecting for other archaeological sites. The data collected will assist in gaining a better understanding of San Pedro Viejo de Pichasca, in particular the association between occupation and art.



Figure 4. *Left: Geometric linear motif located in the rear of the ceiling within the central section of the rock shelter. Right: The same geometric linear motif enhanced by D-Stretch.*

Images: G.H. Nash.

Due to the sometimes poor state of preservation of the pictographs and the fact that most are under a layer of soot, recording and subsequent conservation has been difficult. In order to accurately locate the paintings a number of techniques have been employed including digital photography of the ceiling and walls of the shelter using a systematic grid across the site. On site photography has clearly identified single and multiple motifs, some of which show clear stratigraphic superimposition. In both instances, imagery was recorded using a portable

digital microscope. Imagery has been later manipulated using Adobe Photoshop and *D-Stretch* software (Figure 4).

Over time, paintings become weathered or sometimes absorbed into certain rock types, becoming invisible to the naked eye. Although the skilful use of a digital camera on site can provide good results, it was felt that further enhancements were necessary in order to fully record any potential hidden imagery. On-site photography included shooting panels using Tiff (Tagged Image File Format) and Raw (un-processed digital data) formats and manually using a low ISO setting.

D-Stretch (for *Decorrelation Stretch*) is a plug-in of Image J software which was developed by Jon Harman (Harman 2008 [2005]). Originally developed for remote sensing by NASA in 1996, this software is a desk-based multispectral image enhancement tool which has been specifically redeveloped to maximise colour manipulation of rock art images, in particular paintings and is been widely used by scholars engaged in the study of rock art (Acevedo and Franco 2012; Caldwell and Botzjorns 2014; Gunn *et al.* 2011). Optimum enhancement is usually achieved when photographing paintings that contain red and yellow pigmentation, usually through the use of an algorithm of decolouration (see Figure 4). *D-Stretch* software is organised into two levels: [Basic] Level 1 - *colourspaces* and Level 2 - *YXX/LXX parameters* which further fractures the chosen colour spectrum offering false colouration to the faintest of images (see Figure 9). Some *colourspaces* and *parameters* codes were created particularly for pictographs (Gutierrez *et al.* 2009).¹

What became apparent when using *D-Stretch* was the unique nature of the geometric and symmetrical patterns some of the pictographs displayed. The spatial distribution of the motifs appear to have been concentrated around a known hearth and occupation floor, located within the central section of the rock-shelter (Iribarren, 1949, 1967, 1970). No paintings or deep stratified occupation activity were located at the extreme ends of the rock-shelter.

Currently, there are around 56 separate motifs located on the ceiling and back wall; the majority of which are abstract or non-figurative designs.² In addition, figurative representations are also present, including two adult handprints (Figure 5). This particular motif is found at a number of sites within the Southern Andes region, for example Cueva de las Manos (Cave of the Hands) in Patagonia, Argentina (Gradin, Aschero and Aguerre, 1976) and is considered to represent personal statementing or ownership of a cave or rock-shelter wall.

Due to the wide variety of the motifs identified and the fact that most of them are non-figurative, we have classified them based on the various geometric elements used in their construction, differentiating between linear motifs, dots, circles/ovals, squares/rectangles or figurative imagery (e.g. positive-hand images). By far, the most common element was the linear motif, accounting for 82% of the assemblage. The linear motif was arranged in various ways, painted mainly as straight lines but all also in complex linear patterns (Figure 6). Of the remaining motif types, dot motifs accounted for 2% of the assemblage, whilst circles/ovals and square/rectangles each represented 6%; hand images accounted for 4%.

The linear motifs were subdivided, owing to their variability. Four groups were defined: (1) Simple linear designs, shaped by a single line that could be in a number of different shapes/forms and orientations; (2) Linear designs with appendixes, in which the dominant line was joined by one or more branch lines; (3) Multiple lines designs, with more than one line.

¹ Editor's note: it is our policy to always reproduce enhanced images alongside originals that have had no more than brightness and contrast altered for printing purposes, so that readers can see all the effects clearly.

² This figure includes images that were discovered by the Anglo-Chilean/Argentinean team in 2013.

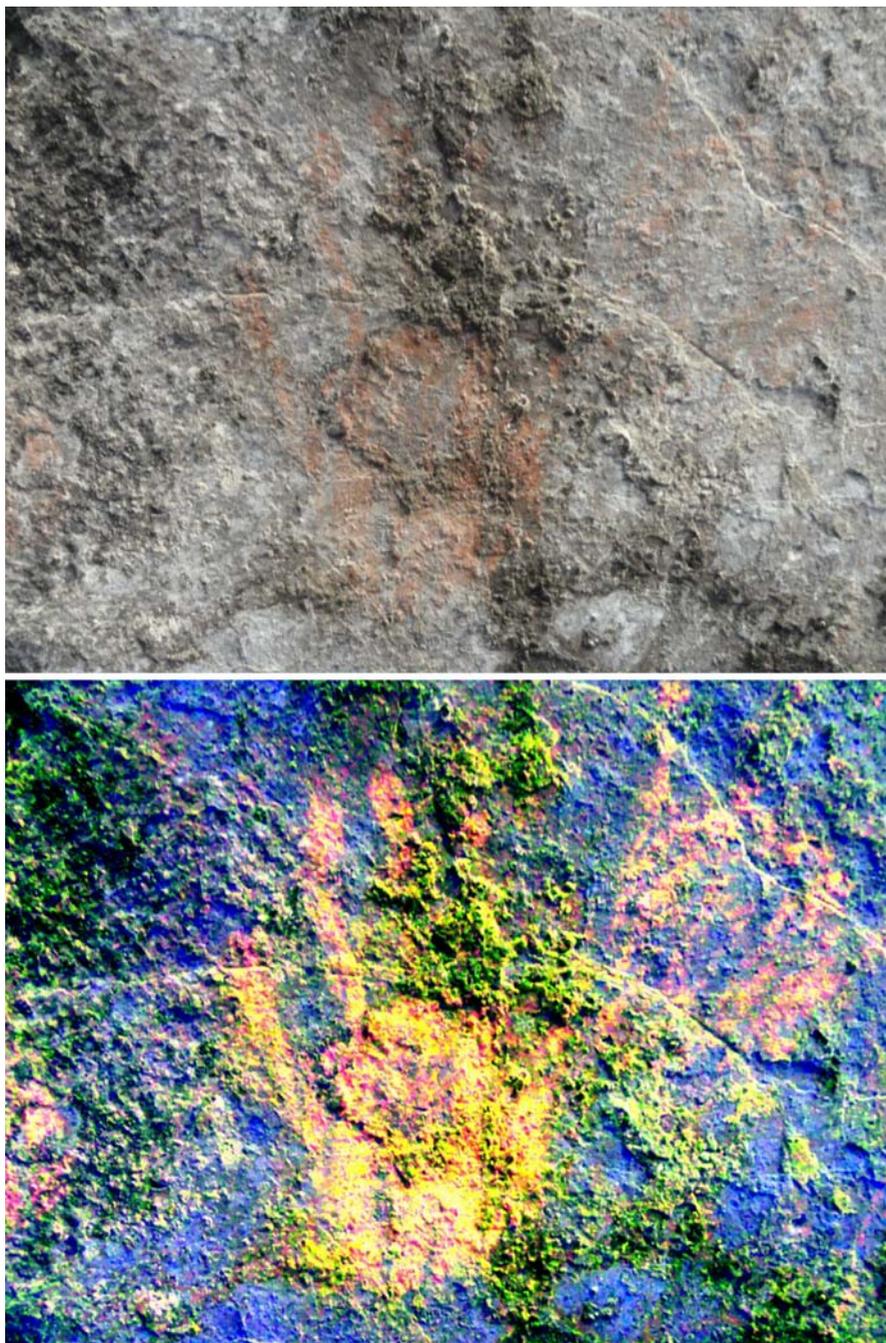


Figure 5. Above: Adult left handprint. Below: The same print enhanced by D-Stretch.
Images: G.H. Nash.

separated from each other shaping a motif; and (4) Irregular linear forms, where the lines cover an area of the panel without creating any regular geometric shape, recognisable to us.

The most represented of the linear motifs were the Simple linear, accounting for 37.5%, followed by the multiple lines designs (27.5%), linear designs with appendixes (17.5%) and the Linear designs making up areas (17.5%). This latter group, although not the most represented, includes some of the most complex non-figurative designs in the Limari Basin.

When considering the pigment colours, it is possible to see motifs constructed in one to three colours. Varying shades of red and yellow are the most commonly used, whilst green is used for constructing two motifs. No other site in the Limari Basin uses yellow pigmentation or uses three different colours to construct the same motif.

Throughout the assemblage there are a small number of motifs found in superimposition. There are some instances where red motifs overlie yellow ones, suggesting a sequential use of colour during a painting session. Where possible, stratigraphic relationships between the various painted elements were analysed using a digital microscope (Figures 7 and 8). Clearly visible under these conditions was the superimposition of a number of colour pigments. The symmetry and design form of the various linear patterns and the strategies employed to construct them is considered a rare occurrence (see Washburn 1999).

The rock art collection of San Pedro Viejo, although based upon limited geometric elements, shows extensive variability in terms of design form. This heterogeneity is associated with a sometimes haphazard composition that shows no clear organisation. However, their distribution within the central section of the cave suggests there may be an association between living space and painting space, moreover, collectively the panels appear to form a liner band across the ceiling.

UNDERSTANDING SAN PEDRO VIEJO DE PICHASCA: FROM THE PLACE TO THE REGION

The San Pedro Viejo de Pichasca rock-shelter is an exceptional site where painted rock art, a rare occurrence within the Limari basin, is found alongside occupation activity. The systematic survey undertaken by the team covered an area of 35 km². The survey allowed the team to identify a further two sites that contained pictographs, both of which are far less complex and smaller than the San Pedro Viejo site. These other sites have open air panels where painted motifs are present. At one site, Las Tinajas, red pigmentation can be identified, but the shape cannot be seen due to weathering (Figure 9). Other rock shelters within the immediate area also show clear evidence of human occupation but no pictographs were present.

The heterogeneity of the pictographs and the complexity of their configuration, together with the high labour investment in the sourcing of materials and production of the pictographs imply that San Pedro Viejo de Pichasca was a significant space within the socio-ritual dynamics of the hunter-gatherer communities who used the shelter. The large occupation sequence at the site, spanning some 10,000 years and size of the occupation floors suggests that the shelter may have been a major seasonal focus for community gatherings, the site being used by hunter-gatherers and later, pastoralists. This occupation space may have been periodically visited by artists who, along with the burial ritualised the shelter, maybe during periods when the site was not used as an occupation site. This change of use appears to have commenced during the latter stages of occupation by hunter-gatherers. Within the same period of time, pigments were also used for other activities, for example the painting of a mammal mandible, suggesting that a ritual package involving static and portable art was in operation.



Figure 6. Above: Curvilinear pattern constructed using a rare yellow inorganic pigment.
Below: The same image enhanced using D-Stretch.

Images: G.H. Nash.

The variety of designs and coloured pigments, the absence of recognisable composition and the presence of limited superimposition, suggest that different phases of painting took place in the shelter, probably by different artists who followed a generic theme. Regionally, the pictographs from San Pedro Viejo display a different style and method to those identified in the coastal valleys further west, where the team have recorded at least 12 other sites containing



Figure 7. *Using a digital microscope to photograph superimposition of different coloured pigments.*

Image: Andrés Troncoso.

Argentinean Patagonia and the southern Andes (Schobinger and Gradin 1985; Menghin 1957, Gradin, Aschero and Aguerre 1976, Podestá *et al.* 2005); several examples are also found in Chilean Patagonia. In some instances, hand images are superimposed but, as in the San Pedro Viejo de Pichasca rock shelter, handprints are limited to single isolated motifs. It would appear that the distribution of the handprint is restricted to rock shelters and caves that are found south of latitude 35°. This being the case, the handprints of the San Pedro Viejo de Pichasca rock shelter are the northernmost examples of this motif in Chile and Argentina. Elsewhere, handprints have been identified in Brazil and Bolivia where they appear as engravings (Elizaga and Hostnig, 2011). The meaning of such a motif is, as yet, unknown, although there have been a number of interpretative accounts to suggest that each handprint may represent a personal signature of an artist or family member (e.g. Nash 2012).

Finally, a topic rarely explored within Chilean archaeological discourse is the symbolic relevance of red pigmentation in hunter-gatherer contexts, a phenomenon seen in many different parts of the prehistoric world, extending as far back as Neanderthal burials during the latter part of the (Euro-Asian) Middle Palaeolithic. In this region, red pigmentation (often identified as ochre or haematite) is not only the most commonly used colour in prehistoric rock painting, but it is also used as a possible symbolic substance during human burial and as a coating on projectile points (found at the Alero el Puerto rock-shelter). The procurement, circulation and processing of this quarried/mined pigment was, without doubt, an essential

pictographs made from various shades of red haematite; however, these sites are on open-air rock panels rather than in shelters. San Pedro Viejo is therefore unique in both its location and the art that is contained within it; reinforcing the notion that this site was central to the dynamics of the hunter-gatherer populations in this region.

The presence of two handprints is a recurrent theme in hunter-gatherer rock art, especially in

activity which played an important role for both the living and the dead (e.g. Parker-Pearson 2000).

The recent discovery in the north of Chile of the oldest iron oxide mine in the Americas shows the great importance that mining had for the human groups of the Pacific coast, and the circulation of this important raw material (Salazar *et al.* 2011).

FUTURE RESEARCH

The San Pedro Viejo de Pichasca rock-shelter is an internationally important archaeological site. The rock art contained within the central section of the shelter is unique in that the subject matter and the pigments used are not found anywhere else within the Limarí Basin and beyond. The archaeological history of the site is complex with much of the fieldwork of the 1960s still unreported. Despite this, in the recent past the rock art has received sympathetic attention with full descriptions of many of the panels being published in regional journals. The current research being undertaken by the team includes photogrammetric and direct and indirect chronometric dating which may be of international importance, taking into account the current debates regarding the peopling of South America.

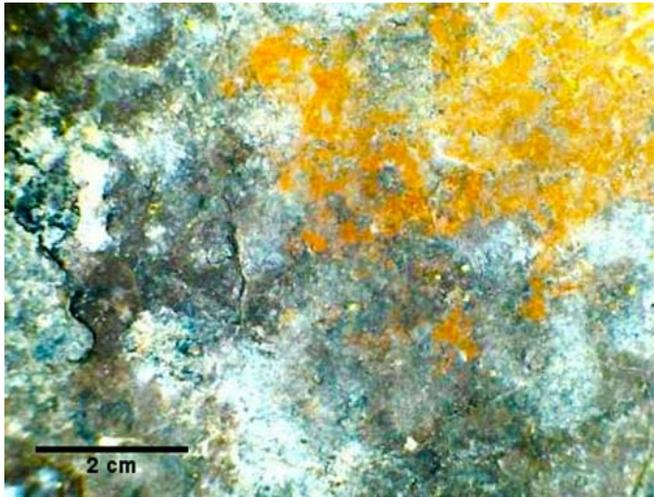


Figure 8. *Digital micro-photographic image of a section of one of the handprints, showing red-brown haematite overlying a soot deposit.*

Image: Francisco Murua.

The research undertaken at the site has allowed limited latitude in determining the date of the pictographs, as well as defining the character of the designs and their comparison within a local and regional context. Unfortunately, it has been difficult to determine a chronological sequence despite superimposition occurring on several panels.

In the future it is hoped to expand the hypothesis presented in this paper through the physicochemical analysis of the pictographs. Specifically, it is intended to extract minute samples of pigment from several panels which will be analysed using X-Ray diffraction and fluorescence. This will allow identification of the composite elements and detect if any organic material is present which may allow standard chronometric dating to take place. Physicochemical analysis will also allow the comparison of the mineral composites from these pictographs with other pictograph sites within the region. This procedure will, it is hoped, identify recipes used for the production of pigments.

In addition to the direct dating methodologies employed, it is intended to analyse samples taken from the various occupation levels that were excavated by Ampuero and Rivera (1971). It is possible that pigment residues may be present and their mineral composition can be

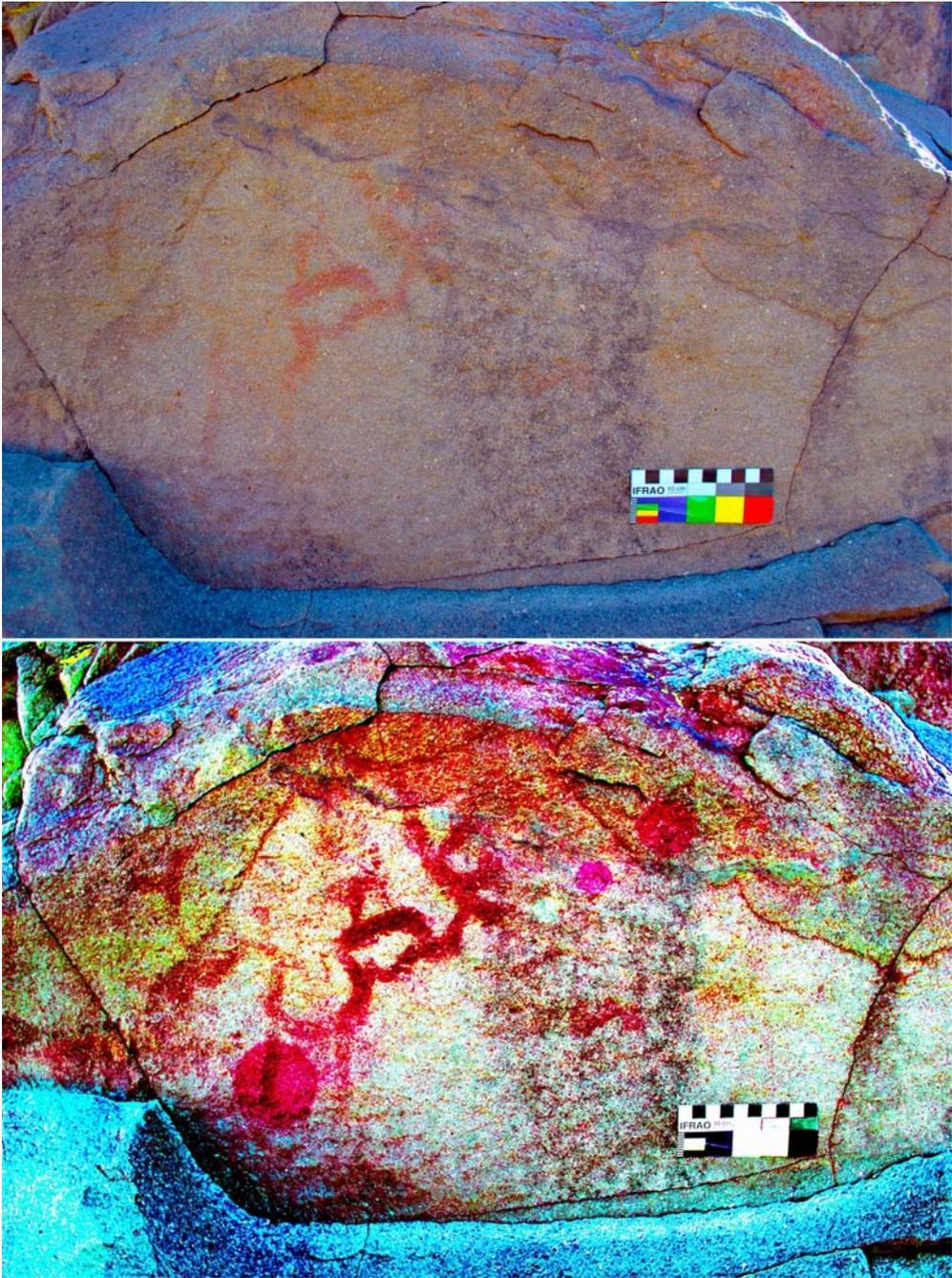


Figure 9. Above: The open air painted panel of Las Tinajas.
Below: The same image enhanced using D-Stretch.

Images: G.H. Nash.

compared with the pigment samples taken from the pictographs above. It is hoped that the dating of organic material within those stratigraphic units where the pigment residues are found can provide indirect dates for the pictographs. In addition to comparative residue sample analysis, within the collected soil samples there are spall fragments from the ceiling which contain pigments; these appear to have fallen away from the ceiling into sealed stratigraphic organic deposits that can be dated using conventional chronometric dating methods.

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