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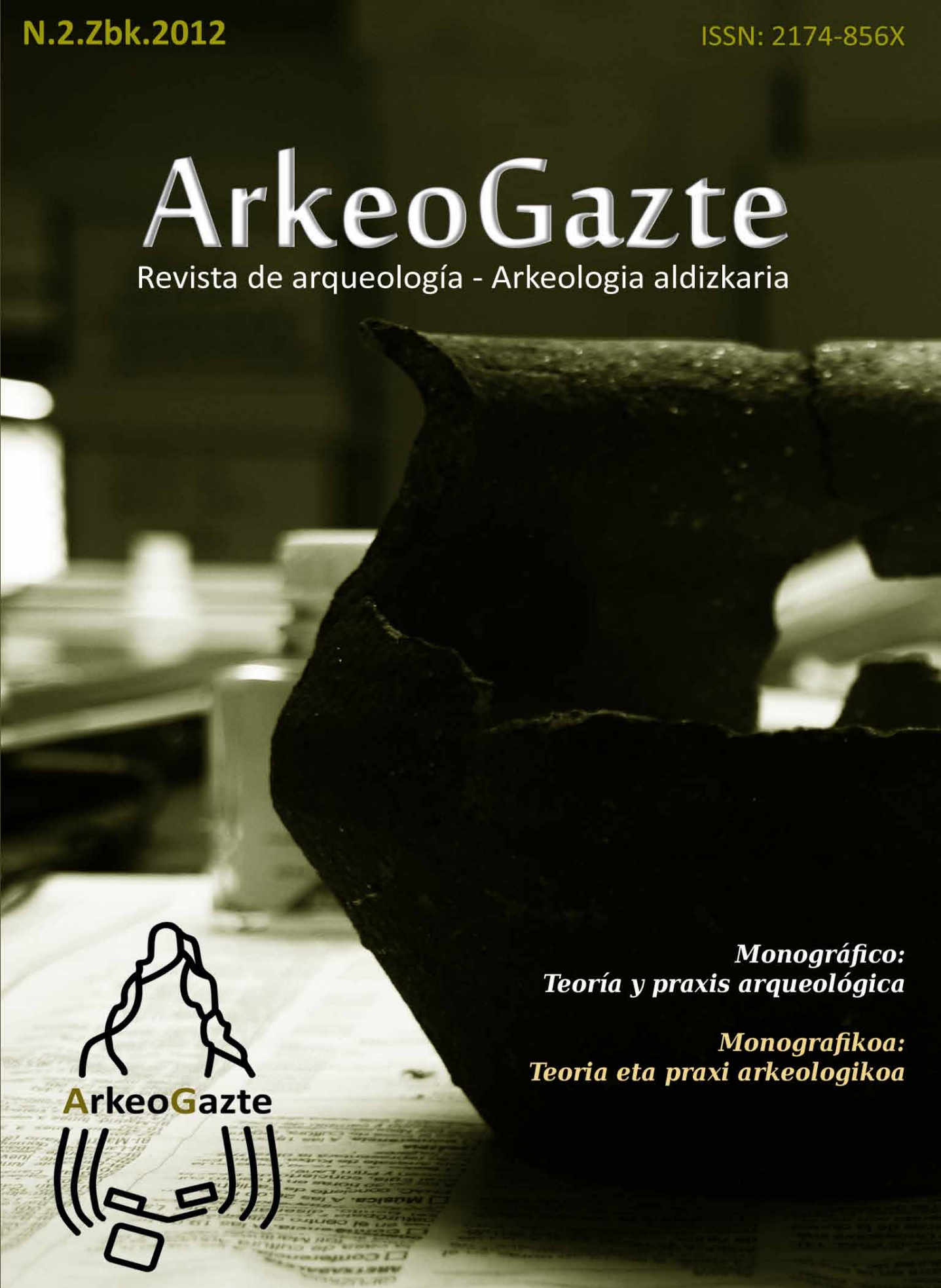

Monográfico:
Teoría y praxis arqueológica

Monografikoa:
Teoria eta praxi arkeologikoa

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MULTIDISCIPLINARY APPROACH TO THE STUDY OF THE ROCK ART: A CASE OF STUDY FROM SUSA VALLEY, ITALY

Un enfoque multidisciplinar para el estudio del arte rupestre: Un caso de estudio del Valle de Susa, Italia

Labar-artearen ikerketaren diziplina anitzeko hurbilketa: Susa Haranaren (Italia) ikerketa kasua

Alice Micaela Toso (*)

Summary:

Throughout the last century the study of the rock art has changed significantly thanks to the contribution of cutting edge studies and it has come a long way since the first studies on rock art. This paper provides a brief overview of the input that the neurological and cognitive sciences have done to the field. Subsequently the involvement of the new technologies in the recording of the rock art is considered, focusing on the benefits of their application in relation to the preservation of the cultural heritage as well. Finally a case of study from the Susa Valley, in the western part of Italy, is presented. The preliminary results introduced here are the outcome of a georeferencing campaign, realized thanks to the GIS technology, on 13 engraved panels included in the rock art site of the Rochemelon. The location and the distribution of the former is discussed in relation to other three similar cases in the same region.

Key words:

Engravings, rock art, Susa Valley, Western Alps.

Resumen:

Durante el último siglo el estudio del arte rupestre ha cambiado de forma significativa gracias a la contribución de estudios innovadores y se ha recorrido un largo camino desde las primeras aproximaciones al arte rupestre. Este artículo hace un breve repaso a la contribución que las ciencias neurológica y cognitiva han hecho a este campo. A continuación se considera la introducción de nuevas tecnologías para el registro del arte rupestre, centrándose en sus ventajas para la conservación del patrimonio cultural. Por último se presenta un caso de estudio del Valle de Susa, al oeste de Italia. Los resultados preliminares que aquí se presentan son el resultado de una campaña de georreferenciación de 13 paneles grabados incluidos dentro del yacimiento de arte rupestre de Rochemelon, llevada a cabo con el soporte de la tecnología SIG. Se discute sobre su localización y distribución en relación a otros tres casos de estudio similares en la región.

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Palabras clave:
Grabados, Arte rupestre, Valle de Susa, Alpes occidentales.

Laburpena:
Azken mendean zehar labar-artearen ikerketa modu adierazgarrian aldatu da, batez ere, ekarpen berritzaileei esker, eta bide luzea ibili da labar-artearen lehenengo ikerketak egin zirenetik. Artikulu honek alor honetan zientzia neurologiko eta kognitiboaren ekarpenaren ikuspegi orokor eta labur bat eskaintzen du. Geroago, teknologi berrien garapena labar-artearen erregistroan gogoan hartzen da, baita bere erabilpenak kultur ondarearen babespenean duen onuretan arreta jarri ere. Azkenik, Italiako mendebaldean dagoen Susa Haranean burututako ikerketa kasu bat aurkezten da. Hemen aurkezten diren aurretiazko emaitzak geo-erreferentzia kanpainaren ondorioak dira, Geografia-informazioko Sistemaren teknologiari esker sartu diren Rochemelon aztarnategian dauden grabatutako hamahiru taula. Azken hauen kokalekua eta antolamendua eskualde bereko beste antzeko hiru kasuekin duten erlazioa eztabaidatzen da.

Hitz Gakoak:
Grabatuak, Labar-artea, Susa Harana, Alpeetako mendebaldea.

1.Introduction

Rock art is definitely a fascinating phenomenon to unravel and even if the investigation is challenging, a lot of scholars have addressed their research to the comprehension of these artistic expressions. Rock art has always produced a strong interest in different people, either for research purposes or for simple curiosity. The main reason is because it is one of the first traces left by group of people regarding their experience as human beings. The first mentions of rock arts during the modern times are due to antiquarians and collectors that, fascinated by these ancient remains, stored them in cabinets and showcases for all the 19th and part of the 20th century. During the first phase of the study of the rock art, the research directed all its attention on single engravings at specific sites. The single specimens were the only focus of the studying, lacking any type of context. This is the classical approach that, after the birth of the interest in the rock art, dominated the field until recent times. It involved almost exclusively the recording of the engravings, with different techniques improved through time, and the classification of them in types and categories. Although this is a necessary approach to the study of the rock art and a proper classification is essential, this method is not totally satisfactory. It cannot even be considered like a proper approach, but rather a first step in the process of the study of the rock art. A more systematic study and scientific approach to the field was not developed until the second part of the 20st century and, in particular, from the 1970s. The rock art will then be considered, following the idea expressed by Nash and Chippindale (2001), as part of the landscape. The landscape and the location acquire the same importance as the paintings or the engravings. It became urgent, then, a more systematic and comprehensive methodology that took into account the rock art as a complex phenomenon. One of the big changes in this process was starting to think about the rock art as a part of the territory and not just as a number of unrelated witnesses coming from an undetermined past. This urgent need will shift the research to a more comprehensive and multidisciplinary approach that from the combination of technological techniques improved the quality of the research on the rock art.

As the multidisciplinary approach is believed to be most suitable to collect as much informa-

tion as possible on these artistic expressions, this paper will give a brief overview of the last lines of investigation applied to the field. In particular the focus will be on the contribution of the cognitive and the neurosciences. The second part of the paper will consider how the technology changed the study of the rock art and the advantages that came with the application of the digital recording techniques to the documentation of the engravings. In the third part of the paper, a case of study from the Valley of Susa, in the north-western part of Italy, will be presented. Here a number of rock art sites have been recognized and preliminary results on the project will be given. Because of the importance of the sites in this valley, an attempt to propose new lines of research for this specific geographical region will be done.

2. A cognitive approach to the rock art

As the rock art is considered one of the first witnesses of the human will, that intentionally left a trace on the rock, a lot of attention has been drawn to the iconography of the subjects, either depicted or engraved. A branch of the studies related to the rock art, therefore, has focused on the implication that rock art had on the society that produced it. Layton (1991) classifies the rock art as a traditional art that acquires a key role in the transmission and preservation of the collective memory. Having a collective memory, though, implies that the society that owns it undergone a sociological process described by Olic and Robinson (1998) as the construction of the social identity. In order to build a proper social identity, human groups need to construct a past to which their present in countered. In other words, the recognition of the past became the way to define their present. The rock art then, as a major history book in open air, could be a trace of the process of social identity construction within specific societies. "Rock art must then be understood not only as a reflection of the culture that produces it, but also as a constituent part of it, since by preserving memories, it promotes certain ways of doing things, regulating social conducts" (BRUZZONE, 2012: 20). If the rock art played a part in the construction of the social identity, it is necessary to analyse its features within the space that shared with the society that created it. The rock art is therefore analysed within the landscape and a lot of studies have been conducted in this sense (ARCÀ, 2006; BAHN, 2010; CRIADO BOADO *et al*., 1997; 2001; NASH and CHIPPINDALE, 2001; SANTOS ESTÉVEZ, 2007).

Some scholars have suggested that the position and the accessibility of the engravings played an important role. For this reason particular attention has been drawn on the position and the intervisibility of the engravings, following the idea that a specific and intentional setting rested behind the location of the engraved rocks. Parkington (2003) suggested that the rocks were carefully chosen for the engravings to be seen from one to the other. In this case a precise planning was hypothesized to be behind the engraving process, leading to important implications concerning the social organization of the human groups that designed it. This approach was criticized by Bahn (2010) that suggested that even if one site can be seen from another, the petroglyphs are usually visible just from very near, particularly on rocks that lie horizontally. Bruzzone (2012) has analysed the spatial distribution of the petroglyphs at Los Mellizos in Chile. He argued that the inter-visibility of the engravings and the poor presence of superimpositions through time indicate that different population produced and manipulated the landscape in order to construct their collective memory. Proof of this long-lasting process is the small frequency of superimposition between older and most recent petroglyphs, as the later populations respected the earlier designs without disturbing the previous one.

A similar case leads to very different conclusion though. This is the study undertaken in the major rock art site in the Coa Valley, Portugal. Here Late-

Glacial and Iron Age rock art seems to follow the same spatial distribution. For this reason Aubry *et al*. (2012) have undertaken an analysis of the spatial distribution. Contrariwise to Los Mellizos, the choice of the same rock in two different historical periods has been interpreted as a "strong argument against the hypothesis of human choice as an explanation for the current distribution of the rock art". (AUBREY *et al*., 2012: 864).

The previous examples were linked to a context in which a social participation to the experience of the rock art is supposed. The open air position, the relatively easy access and the high visibility of the engravings suggest that the entire community will come into contact with the rock art. (HYGEN and BENGTSSON, 2000). However, this is not the case for all of the open air sites and some scholars have argued that the engravings were accessible just for a restricted number of people within a society, mostly because they were difficult to reach and the nature of the terrain itself will enable few people to see the engravings at the same time (BOIVIN, 2004; SUNDSTROM, 2004).

Asit has been shown, the cognitive approach and the perception of the rock art within its landscape has produced some interesting research so far but interesting advances have also been done following the neuroscience and the popular "archaeology of the senses" . This new field has greatly developed in the last 10 years, trying to understand how the ancient populations perceived the world around them. Especially when it comes to the ritual sphere, it is likely that all the senses of the people were involved in the ceremonies, creating a more complicated scenery than what we can reconstruct from the material culture (HAMILAKIS, 2002; HOUSTON and TAUBE, 2000). The rock art is very useful in this matter because it is itself a symbolic representation of the world, in which those people lived. The rock art was lived as an experience and not just as an artefact on a rocky surface. Following this stream of thought we will focus of two studies that have analysed the role of the vision and the hearing in 'experiencing' the rock art. Neuroscientific studies have been conducted because, although the rock art covers a long period of time and wide geographical areas, strong similarities can be traced within the type of drawings and engravings. Even though the societies that express themselves through the rock art are very dissimilar in time, location and social organization, the figures can be ascribed to no more than two dozen of types. Neuroscience then, can give its contribution to the understanding of the process of such a choice (BEDNARIK, 1984; GILBERT, 1998; HOLLINGWORTH and HENDERSON, 1999; SOLSO, 1993). Attention has been drawn particularly on the role of the anthropomorphs and to the zoomorphs (ANATI, 1975; ARCÀ *et al*., 1988; BEDNARIK, 1990).

In the case of the anthropomorphs a great level of schematization is displayed. The most basic representation of the human figure involves one vertical line for the trunk of the body and one horizontal line for the arms. One of the reasons of the repetition of these very schematic figures lies in the neurological setting of our brain and in particular in the hierarchical organization of the visual cortex. In fact, the cells situated in the visual cortex are "organised to respond to specific orientation of lines, and perception may be fabricated from the accretion of selected features" (HODGSON, 2000:8). In other words our brain results to be more responsive to those figures that stimulate the outer layer of the visual cortex, i.e. the simple geometric figure. This preference is particularly suitable in explaining the recurrent choice of schematic figures but it does not really justify why the anthropomorphs and the zoomorphs are among the most frequent subjects of the figurative rock art.

What we need to introduce at this point is the concept of cognitive domains. Following Helvenston and Hodgson (2010: 69) "stressful interaction with everyday objects or animals can put a strain on cognition such that the individual is

obliged to concentrate on more immediate concerns that depend largely on automatic cognitive mechanism". In other words there are some naturally disposed cognitive forms that have been created during the evolution such as the need to recognize a predator lost in a wide open horizon. Depending on the environment and on the visual "stress" which the engravers were exposed to, the brain will be more reactive to some figures than others. Either because of the danger that comes with them or because part of the domestic sphere, specific subjects will be automatically preferred by the brain and repeated on the rock.

It has to be admitted that the cognitive approach applied to the analysis of the rock art is very fascinating but a good level of caution is needed. One of the critics directed to this approach is the oversimplistic assumption that the cognitive processes are the only element that affects the choice of the engraved subject (TAÇON, 2010). The social constructs and the environment in which the engravers lived should be considered as well. Otherwise the risk is to lose contact with the real iconography of the engravings that, in many cases, shows subtle variations and exceptions that passed under silence to support the grand theory.

The vision and the way in which the images are processed by the human brain is not the only approach that has been applied to the study of the rock art. Because of the open air nature of many of the major rock art sites, some scholars suggested that the acoustics of the place could have been a discriminant factor in choosing the location (DEVEREUX and JAHN, 1996; GOLDHAHN, 1999; 2002; HEDGES, 1993). The rock art is perceived as a whole experience that should involve more than one sense and recall, in this way, a wide range of emotions and feelings. One example of the application of this approach is the study that has been conducted by Williams (2012) on the relationship between the rock art and the ritual behaviours analysing the area of Uncompahre Plateau of west-central Colorado. Williams applied the five characteristics of ritual behaviour postulated by Rappaport[1] (1999) combined with two or more variables, to the study of twenty-two rock art panel locations. One of the most important critiques that has been done by Williams is addressed to the general assumption that if an archaeological evidence cannot be ascribed to a functional categories, i.e. subsistence, warfare or trade, is automatically placed within the rituality. Once again an attempt to consider the rock art as a full experience and not merely as a list of engravings can give interesting insights on this widespread phenomenon.

3. When the future meets the past

The development of the digital technology in the last 20 years has brought a real revolution in all the aspects of the present day life. Of course the scientific research has also benefitted from this development and methodologies as well as techniques are constantly updated by new and improved versions of themselves. It has to be noticed though that the archaeology seems to be quite reluctant to the adoption of the new techniques. Even though the same methodology was already exploited in different disciplines, it takes some time before it is applied also for archaeological purposes. However, despite the initial hesitations, the advantages of the digital era are all in favour of the research that has now powerful tools to reassess previous results and add new data. In the field of the rock art three technologies have vigorously changed the recording system: the GIS technology (Geographic Information System), the digital photogrammetry and the 3D laser scanning.

1 Rappaport summarizes the characteristics of ritual behaviours in "performance, formality, invariance, inclusion of both acts and utterances, encoding by other than performers"(Rappaport 1999:24).

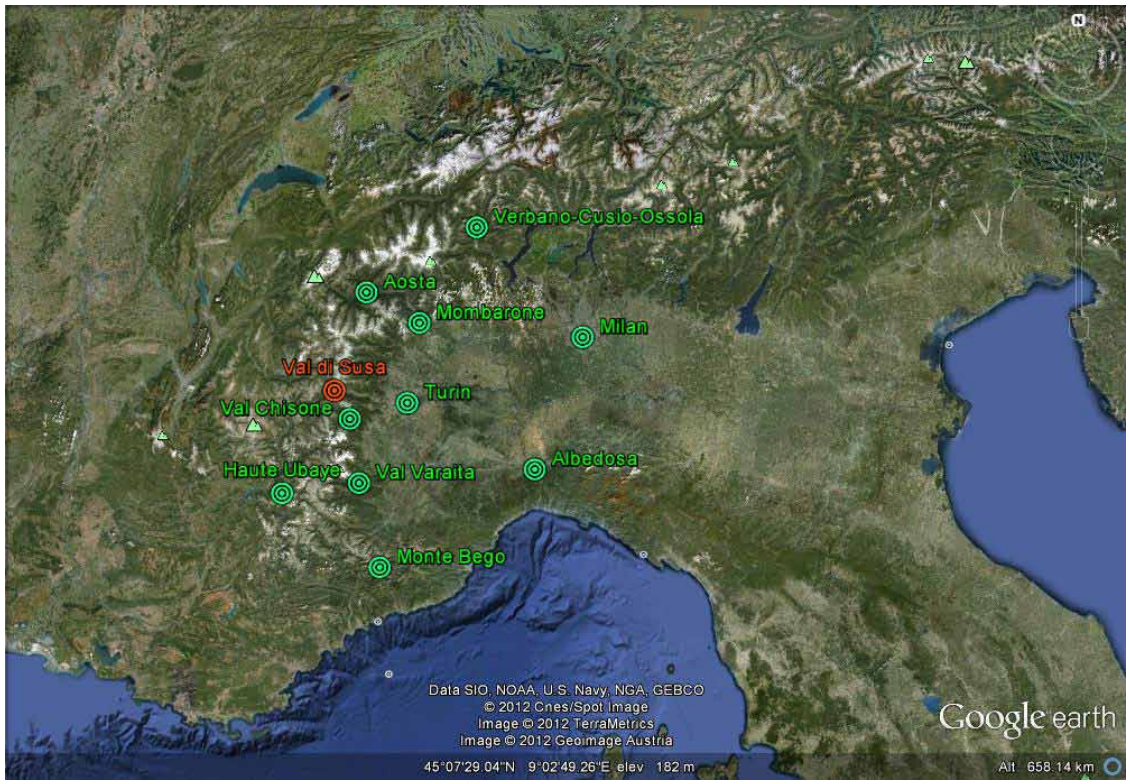

Figure 1. Distribution of the main rock art sites in the western Alps. In red it is indicated the Valley of Susa, where this research has been done

The GIS based models are now spreading into all the disciplines of archaeology. This is because of the great quality of the data that can be obtained from their manipulation as well as a correct and precise georeferentiation of any given point. This system can be applied to a wide range of researches and within archaeology can be used for the purpose of georeferencing a site or a complex of sites, for the recording of distribution of artefacts or burials, for statistical applications and calculations. Because of the versatility of this technology a wider review will be needed in order to give an idea of its potential, however for the purpose of the paper we will focus more on the digital photogrammetry and the 3D laser scanning, as directly related techniques for the recording of the rock art (FELLEMAN, 1990; GILLINGS and GOODRICK, 1996; WOLF, 2001).

Before the advent of the digital era, archaeology used three techniques to record rock art graphically: freehand drawing, rock rubbing or tracing and photography (STANBURY and CLEGG, 1990). Even if the traditional methods have been improving through time, they are not still completely satisfactory. Digital photogrammetry is in this sense very useful to collect three-dimensional data capture and process it with high-resolution (GONZALEZ-AGUILERA *et al*., 2011; CHANDLER *et al*., 2005). The potential of this technique lies in the fact that at a rather low cost, high quality images can be obtained and subsequently processed with modern software to obtain digital elevation models and orthophotographs. A possible application has been illustrated by Chandler *et al*. (2005) considering the recording of two petroglyphs in New South Wales, Australia. The images were taken with a digital camera from a height of 1.4 m and 1.6 m. The area included in the picture should be delimitated with several targets. Three dimensional co-ordinates of each target have to be taken, either with theodolite intersection

method or with a Total Station. The processing will require standard photogrammetric procedures that include extracting digital elevation models (DEMs) and creating orthophotographs. A different approach to the digital photogrammetry was proposed by Ortiz Sanz *et al*. (2010) were low cost photogrammetric software and consumer-grade digital camera were used to produce a 3D digital model of three petroglyphs from Galicia, Spain[2].

In some cases, the digital photogrammetry has been used in conjunction with the 3D laser scanner because of the high detailed models that produces (FRYER *et al*., 2005; AL-KHEDER *et al*., 2009). The Terrestrial laser scanner is particularly suitable for the recording of the rock art. It has been used especially for cultural heritage applications such as buildings, monuments, statues but also to document specific layers in archaeological excavations (BENDELS *et al*., 2004; DONEUS and NEUBAUER, 2006). The 3D laser scanner operates with a laser light source that emits a laser pulse which is reflected by the surface of analysis. The laser scanner records the distance to the reflecting surface thanks to the travel-time of the light pulse. Knowing the azimuth and the inclination of the laser itself it is possible to reconstruct the relative co-ordinates of the reflecting points and absolute co-ordinates can be deduced with differential GPS measurements. These methods have been used by a team of the Politecnico of Turin (Italy) on two of the recorded engravings in the Susa Valley and the results of this experimental

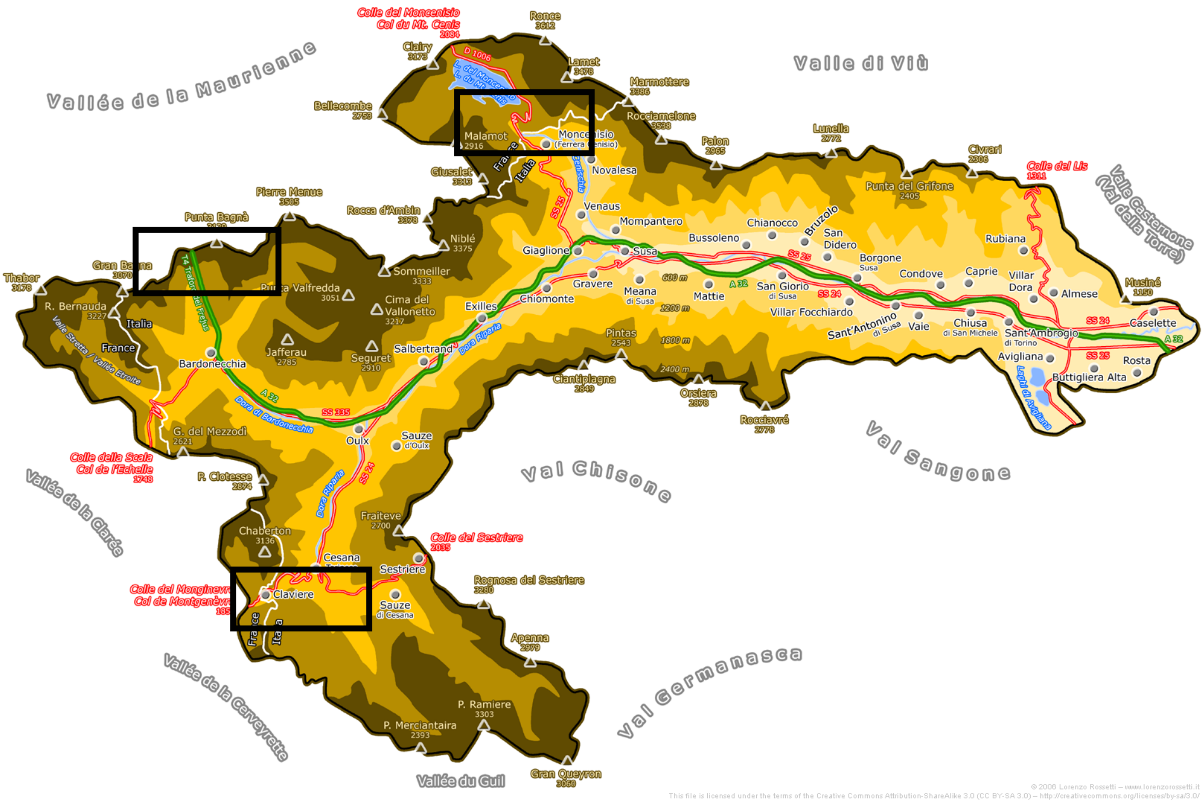

Figure 2. Susa Valley. Map showing the path of the main river Dora Riparia and the two contributors. The black squares indicate the location of the three main mountain passes toward the France. © Lorenzo Rossetti (Creative Commons ShareAlike-3.0 license)

study are now in the process of being published.

2 Other examples are proposed by Clogg and Diaz-Andreu (2000); Diaz-Andreu *et al.* (2006) and Chandler *et al.* (2007).

Number displayed on the map	Type of engraving	Coordinate North (X)	Coordinate East (Y)	Latitude	Longitude
1	• Spirals • Meanders • Anthropomorphs	5000799.763	348682.920	50.1605055	7.8614015
2	• Anthropomorphs	5000785.931	348472.425	50.1603170	7.8584329
3	• Cup-marks	5000922.051	349141.898	50.1618370	7.8678437
4	• Spirals • Meanders • Modern letters	5001024.541	349529.611	50.1629535	7.8732860
5	• Cup-marks	5001055.968	349620.001	50.1632890	7.8745524
6	• Axes • Spirals • Meanders	5001070.955	349755.791	50.1634710	7.8764655
7	• Meander • Letters	5001074.166	349768.509	50.1635061	7.8766441
8	• Cup-marks	5001117.029	350186.727	50.1640333	7.8825376
9	• Meanders	5000895.543	349089.796	50.1615597	7.8671166
10	• Cup-marks	5000891.145	349096.263	50.1615172	7.8672094
11	• Anthropomorphs	5000892.736	349096.362	50.1615332	7.8672103
12	• Cup-marks	5000970.400	349429.855	50.1623886	7.8718950
13	• Cup-marks	5001126.871	349794.883	50.1640392	7.8769991

Table 1. Breakdown of the recorded engraved panels. The table shows the typology and the coordinates of the engravings

The advantages of these techniques become apparent once its application is shown. A high-quality scanning can, in fact, detect subtle changes on the surface and also on weathered features, almost impossible to be seen by eye. Even though the high initial cost of the equipment, the potential of the application of this machines is very wide and a lot of examples can be found in the recent literature (CAMPANA and FRANCOVICH 2006; LAMBERS *et al*., 2007; ROBSON BROWN *et al*., 2001). The versatility of these techniques has proved to be suitable for application in several archaeological situations, from single rocks recording (TRINKS *et al.,* 2005), to larger panels (GONZALEZ-AGUILERA *et al.*, 2011; HURST *et al.,* 2009) and even entire caves (LERMA *et al*., 2010). This technique has also an implication on the preservation studies of the rock art because it is actually the most precise method to analyse the index of weathering through time. As its application is just now developing, it will take some time until the results will be effective but, surely, it could be a very powerful tool in the field of the cultural heritage preservation.

4. The susa valley: a case of study

As it was anticipated a case of study from the Susa valley, in the Piedmont region, will be presented in this paper. The Susa Valley is situated in the north-western part of Italy and is geographically ascribed to the western Alps complex. The pattern of distribution showed by the preliminary results of our research are similar to other two areas in Piedmont and for this reason our case will be considered in relation to them (BARALE, 1997; BOVIS and PETITTI, 1971; VAUDAGNA 2003).

The alpine region is widely known as a major site of rock art especially thanks to the engravings of the Val Camonica, which is one of the major sites of petroglyphs in the world and is included in the World Heritage List. Because of its exclusivity this site was thoroughly studied, and the rest of the alpine regions that shows rock art were not

examined in the same way. According to this, it seems important to show just some of the major sites of rock art in the western Alps and that are displayed in Figure 1.

The Susa Valley has a strategic location within the Alps. It is a wide open valley crossed by a large river, the Dora Riparia, a tributary of the river Po and within the entire western Alps, the Susa Valley presents the major number of mountain passes at relatively low altitude towards France. The most important are three, which are situated in correspondence with the path of the main river Dora Riparia and its two tributaries. (Figure 2).

It is not surprising then, that this valley presents evidences of frequentation since the V millennium BC linked to the pastoral economy. Traces of systematic settlements though are found just from the late Neolithic period on (RUGGIERO, 1987). One of the most interesting sites within this valley is the Maddalena of Chiomonte where a complex development of the population characterized by small groups of houses widespread in the regions can be seen. Even though it does not appear to exist a big social organization in the later phase of the Neolithic and the first Bronze Age, the material culture testifies an active trading system with penetration of pottery from the Padana plane linked to the southern group of the *Ligurii*, but also from the region of the Saone-Rhone (BERTONE and FOZZATI, 2002) in France.

Within the Susa Valley the major site of petroglyphs is located in correspondence to the massif of Rochemelon (italian Rocciamelone). Within its extension it has three complexes: Val Cenischia, Mompantero-Chiamberlando and Chiomonte-La Maddalena. The work of georeferentiation started from the complex of Mompantero – Chiamberlando and the preliminary results of the distribution of the engravings are here presented.

4.1 The project

One of the main reasons that iniciated the project in the Susa Valley was the total lack of modern geographical data of the engravings. The research group Gruppo Ricerche Cultura Montana and the archaeological cooperative Le Orme dell'Uomo, has recorded and analysed through years the majority of the engravings present in the valley (ARCÀ, 2009, ARCÀ and FOSSATI, 1995) and it appeared necessary to complete this work with the GIS technology. Many of the engravings represent abstract figures and the most frequent motif is the cup-mark. As previous researches have shown (BEDNARIK, 2008), this sign is as frequent as persistent in the rock art all over the world. Many interpretations have been proposed but the use of this sign from the prehistory until modern times makes the picture more complicated. A complete interpretation is far to be made, as a lot of data are missing from many areas where the engravings are located. This research though will be a step towards a better understanding of the phenomenon of the rock art in the Susa Valley. Because of its enigmatic nature, it is necessary to put into context these artistic expressions in order to see if there is any pattern that can help in the study of its development[3].

4.2 Materials and Methods

In order to complete the georeferencing of the engravings in the Mompantero-Chiamberlando complex, it was used the differential GPS GNNS receiver Topcon GMS2-Pro. This study has registered 13 engraved panels and the measurements were taken with a medium error of 20 cm.

The 13 panels were chosen on the criteria of their accessibility. The memory of the exact locations of all the engravings has been partially lost and we traced the positions of these 13 panels

3 For the recording of the rock art in the Susa Valley see Arcà (2002, 2009), Tonini (1992).

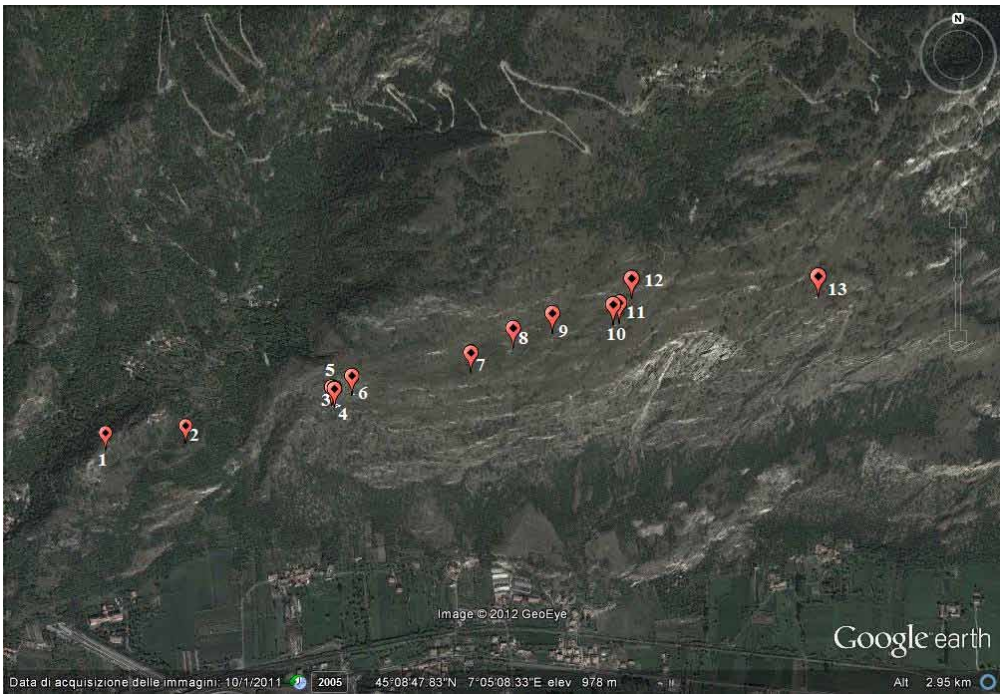

Figure 3. Distribution of the engravings within the complex of Mompantero-Chiamberlando. Results of the survey

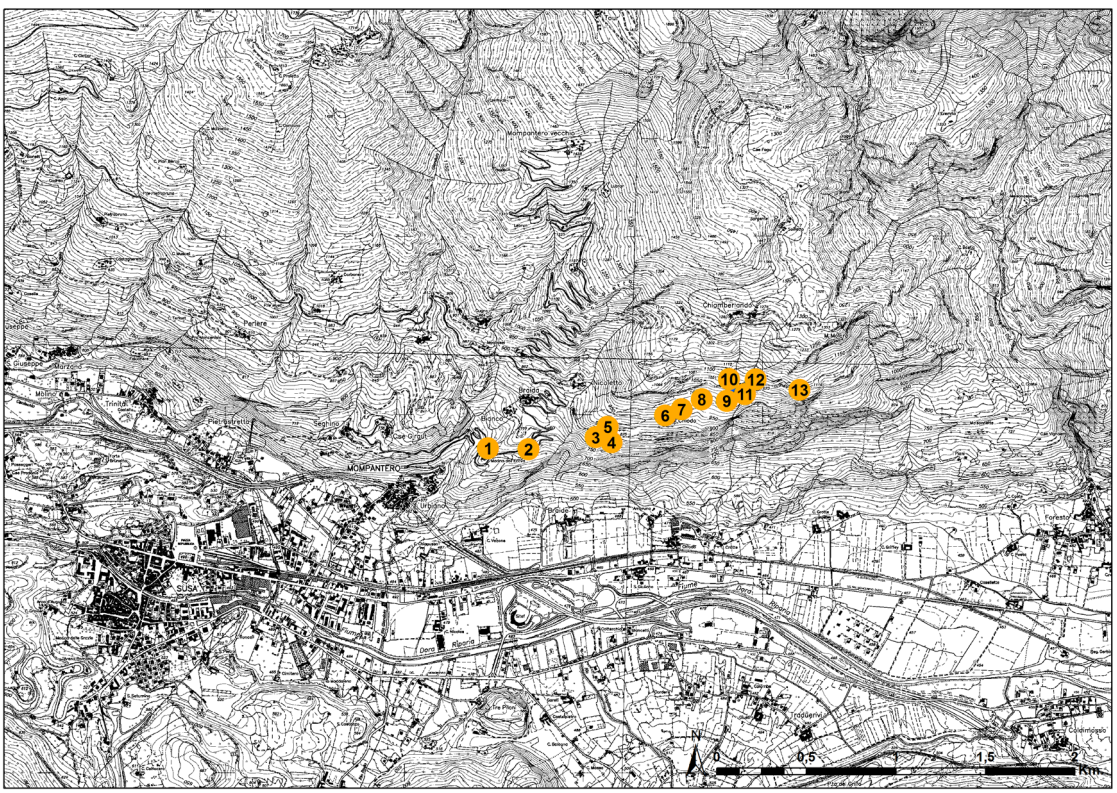

Figure 4. Overview of the distribution of the engravings in relation to the town of Susa and the southern side of the Rochemelon

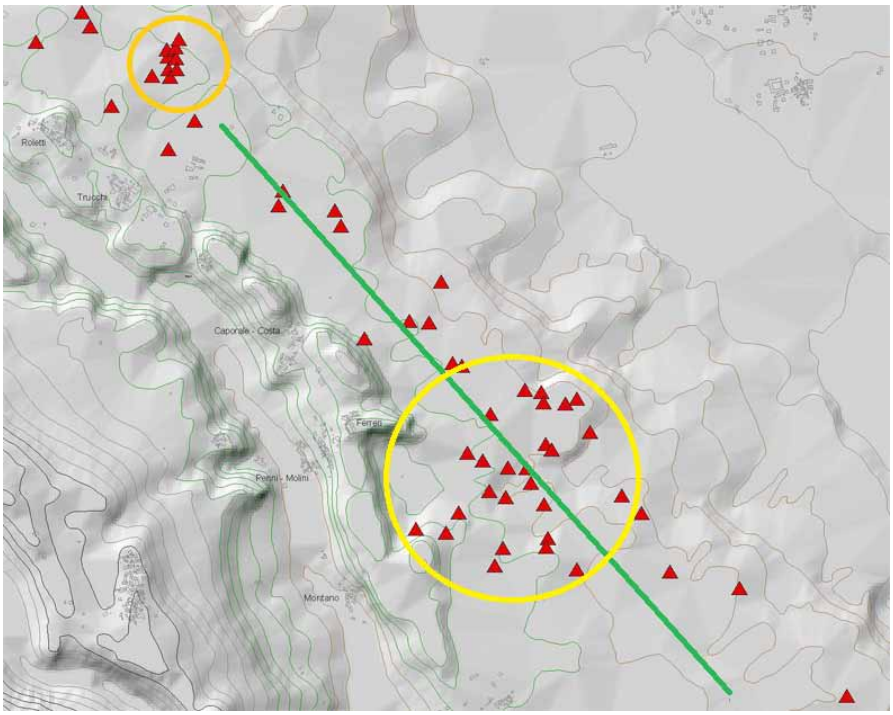

Figure 5. Location and distribution of the engraved panels in the Chiusella Valley. Courtesy of Alberto Vaudagna

thanks to some people still living in the valley. The engravings are located along the eastern and southern slope of the mountain at a medium high altitude. The first panel is located at 781 meter AMSL while the last one is located at 1096 meters AMSL. The typologies of the engravings are shown in Table 1 and can be divided in 5 groups: cup-marks, spirals and meanders, weapons, anthropomorphs and modern letters and numbers.

4.3 Results

As the map shows, the location of the engravings follows so far a rather aligned distribution that is in relation to the path that from the village of Mompantero, brings to the top of the Rochemelon. In the following table the breakdown of the recorded petroglyphs is presented with the coordinates. As it does not exist a common identification code for the engravings, this paper followed the classification of Arcà (2009). When the engravings were not present in the Arcà catalogue, it was used the one proposed by Tonini (1992).

4.4 Discussion

The first difficulty that we encountered in this project was to locate the engravings. In the 1980s the Architect Tonini started his work of recording and cataloguing all the engravings located on the eastern side of the Rochemelon but since then no one proceeded to georeferencing. Even if the frottage of all the engravings is published, the exact location has been lost in the memory of the people that recovered them. This precarious situation justifies once more the urgency of this project from which the preservation of the cultural heritage will benefit as well.

Because of the unknown location of the majority of the engravings, we had to limit the study to the petroglyphs whose locations were known by the people that still live in the valley. The help from the people was the only way to start locating the engravings but we immediately realized that the majority of the engravings were along a main path or nearby it. It firstly appeared that the results produced by the research were biased but subsequently an alternative line of further investigation was also taken into account.

The Rochemelon is one of the highest peaks of the western Alps and it was considered to be the highest one in Medieval times. During the Roman times it was dedicated to Jupiter and

Figure 6. GPS track of the "Souls' Path" in Chiusella Valley. Courtesy of Volpiano Vauda Park

the cup-marks were interpreted as the sign of the thunderbolts thrown by the god (GAMBARI, 1992). During the Medieval times the monks of the near Abbey of Novalesa tried to reach the peak and in modern times a cross, dedicated to the Virgin Mary, was erected on the top of the Rochemelon becoming a place of pilgrimage. The peak of this mountain then, appears to have been an important site for the rituality of this valley through the centuries starting from the prehistoric times until the present day.

Even if we cannot be sure about the relationship between this mountain and the people that populated the valley, there are legends in the folklore of the region that talk about the worship of the mountain in the past as the house of the gods. The oral sources as well as the folklore of a region can be unique sources of information otherwise lost, but caution is required when it comes the interpretation of these data. Even with the necessary wariness it is worth noting that there are other three cases in Piedmont in which the path that leads to a prominent area on the top of the mountain shows a high concentration of petroglyphs. The first area is on the southern side of the Mombarone mountain in the Biella Alps were two cases can be observed, while the third case is located on the southern side of the Monviso (BARALE, 1997; VAUDAGNA, 2003)[4].

Regarding the Mombarone mountains, there are two areas in the same circuit that are particularly interesting to our study: the Bessa Natural Park and the engraving of the Chiusella Valley. The Bessa Natural Park is a low altitude plateau originated from the Pleistocene glacial moraines. This plateau is composed of two parts: the first one is a low altitude terrace that communicates with the plain below, while the second part is the highest peak of the massif and communicates with the Rhone Valley and the Helvetic plateau.

4 All the locations and legends of worship and pilgrimage to the peak of the mountain are reported in BARALE and GHIBAUDO 1996.

The frequentation of the region started in the Neolithic period and evidences for the presence of groups of people in the valley are some obsidian tools and anthropomorphic stele found in the same area (GIANOTTI, 1998). The occupation of the plateau was particularly intense during the roman period, especially because of a small gold-bearing ore located in the northernmost part of the massif (BRECCIAROLI, 1996). The rivers that crosses the plateau was probably rich in gold fragments and drawn the attention of the groups of people living in the valley. The presence of gold in the region can be seen as a reason of the devotion that is traditionally linked to the area since the VI-V century, when the Salassi, a celtic-ligurian population, controlled the plateau (VAUDAGNA, 2002; GIANOTTI, 1998).

The first complete census of the petroglyphs located through the Bessa plateau was done in 1997 and a revision of it was conducted in 2003 with the production of a digitalised map with the GIS technology. The engravings can be ascribed to three types: cup-marks, canals and foot-shaped engravings that have been ascribed to the Pre and Proto-historic period (SCARZELLA, 1992). Even though the foot-shaped mark is rather typical of this area, the cup-marks and the canals correspond to the same typologies of the Susa Valley's engravings. For this reason a similar chronology has been proposed and in particular the proto-historic period from the V to the II century BC has been regarded as the period of major production of the rock art in both valleys. The most important element in relation to our study is the distribution of the Bessa engravings along the path that runs across the plateau and leads to the highest area of the table land. As it is shown in Figure 5, the engravings are located all the way through the plateau following the path that crosses it at the midline. The two circles represent the two major concentrations of the engravings in the plateau. A relative chronology was established based on the typology of the engravings: the orange circle indicates a concentration of the more ancient engravings while the yellow circle shows the second concentration on the plateau that was ascribed to a later phase. Vaudagna (2001) suggested that the engravings of the second phase where linked to the settlements that were established in the Valley by the Salassi. This would actually explain the creation of a second group of engravings at the base of the path that leads to the peak.

In the same district of the Mombarone mountain, in the Chiusella valley, there is another interesting concentration of petroglyphs. A fairly recent survey led in the 90's, increased the number of the engraved stones from 7 to 12 with a total of 90 petroglyphs. As in the Susa Valley, the same stones have been engraved many times in different historical periods (ARCÀ *et al*., 1998) and the typologies of the engravings follow the standard pattern: cup-marks and canals for the most ancient period, meanders, tools and anthropomorphs for the Iron Age and Christian crosses for the Medieval times. The 12 engraved rocks follow a coherent distribution along the path that from Traversella reaches Piani di Cappia, passing from 700 m to 1300 m of altitude. This situation is very similar to that one in the Susa Valley because both the sites are based at medium altitude, along the southern side of the mountain and reach a projecting and panoramic small open space on the top of the mountain. The frequentation of the Chiusella Valley has been attested since the Neolithic period, probably by groups of people practicing a pastoral economy (BOVIS and PETITTI, 1971). The engravings dating from different periods of time with the distribution along the path of the pethroglyphs seem to indicate a strong relation with the groups of people that lived in the valley and this specific area. The perpetuated frequentation of the path, that reaches the peak of the mountain, supports the idea that pilgrimage and some kind of rituality was linked to this path since the late prehistory and continued since recent time. The path is also known in the oral folklore of the region as the path of

the souls (Figure 6). Unfortunately there aren't historical sources about the origins of the name and we cannot be sure about the time of its first appearance (ARCÀ *et al*., 1998).

The third case that is comparable to the situation described in the Susa Valley. It is located in the Po Valley on the side of the Bracco Mountain. This massif is a low altitude mountain, ascribed to the district of the Monviso's mountains, that connects the plane of Cuneo to the Monviso mountain. The whole massif is very rich in petroglyphs and engravings but there is a specific area where a group of engravings has been recognised in a small sector. The location is once more very similar to the case of Mompantero in the Susa Valley, because the engravings are on the southern side of the mountain, following a path that reaches a higher plateau dominating the whole valley. The path that nowadays goes across the slope of the mountain, links Bricco Lombatera to the panoramic plateau of Pian Croesio. Starting from Bricco Lombatera, all the way along the side of the mountain, 50 panels with engravings have been recorded. The petroglyphs of this valley have been dated to the Iron Age because they follow the same typology that we have seen in the first phases of the other cases: cup-marks, canals, foot-shape marks and anthropomorphs (SEGLIE 1988). The first frequentations of the mountain have been linked to the exploitation of the cave of quartzite on the Bracco mountain, dated to the Early Iron Age. In this region archaeoastronomical studies have also been conducted and Barale (1997) and Cavallera (1990) suggested that the engravings should be considered in relation to a series of megalithic stones that seem to surround the area of major concentration of petroglyphs at the top of the mountain. The presence of big oriented stones on the top of the mountain has been interpreted as a trace of altars and open air shrines linked to some kind of rituality (CAVALLERA, 1990; BARALE, 1997).

As we have seen in the three cases presented in this paper, there are other areas in the Western Alps that have a similar setting with a main path that goes across the southern side of the mountain and reaches a projecting plateau or the highest peak of the mountain with the engravings located all the way along the track. All the three cases also show an early frequentation of the region linked to caves exploitation and pastoral economy and elements of rituality linked to the route are kept in the oral traditions. Even though the Susa Valley and the case of Mompantero need to be thoroughly investigated, the pattern that is coming out of the preliminary results seems to follow a similar setting to the other cases. The engravings and the pethroglyphs would have been used then as signals along a path that played an important role in the rituality of these people.

As it was previously said, the typology of the petroglyphs is very similar in all the three cases and can be placed within the major category of the rock art of the Western Alps. In general the motifs are very schematic following the idea that our brain is more stimulated by simple geometric figures. What is worth noting though is that with the changing of rituality there is also a change in the type of the figure, following the idea introduced with the automatic cognitive mechanism (HELVESTON and HODGSON, 2010). The social constructs then have a stronger influence on the human mind than the simple visual perception. In other words, even if a figure is less "attractive" to our brain, it can be inserted in the figurative repertoire because of its meaning within a society. If the figurative representations follow the social constructs then we should see a shift in the repertoire during the century and it's actually what it is observable in the engravings under study. The Neolithic frequentation, linked to a pastoral economy, left traces in the form of cup-marks that have been interpreted as little tray for ritual offering to the gods. In the second phase of the engravings, that have been dated to the Bronze and Iron Age, the society in more organized, the valleys were more populated and new ideologies

are displayed on the rocks. Weapons, meanders, knights and canals that linked previously existing cup-marks are typical expression of the second phase. During the roman times the engravings seem not to be modified or more likely, the same type of petroglyphs were repeated. In the Early medieval times, with the christianisation of the alpine valleys, along the path christian crosses and crucified anthropomorphs appeared. Following the cognitive approach, if all these paths were used as pilgrimage routes, then the petroglyphs displayed on the rocks are linked to the social constructs of the societies that inevitably affected the artistic expressions and the experience of it.

Further research is necessary to investigate if this type of settings and distribution of the petroglyphs is a mere coincidence or rather a reflection of a cultural behaviour that voluntary left a trace in the landscape. It is not known which kind of ritual connection there was between the people living in the valleys and the mountains around them, if it ever existed. However with this research new questions can be addressed to the role of the rock art within the groups of people populating these areas. A complete analysis, focusing on the medieval and modern engravings can create a map of the relationships between the people and their territory through time. Furthermore a systematic record of the exact geographical location of the engravings and petroglyphs is considered necessary in order to preserve the richness of the cultural heritage in the western Alps.

5. Conclusions

The study of the rock art is a discipline that still preserves some grey zones that need to be properly analysed. Since the beginning of the research about the artistic expression left by the men of the past on the rocks, a lot of new methodologies and techniques have been developed with a huge benefit for the field. The neurosciences and the cognitive approach helped in the process of understanding the human mind and archaeologists tried to apply these methodologies to the symbology and to the meaning of the rock art all over the world, with interesting results. Similarly the improving of the technology in the past 20 years gave new and powerful tools to the archaeology in general but also to the study of the rock art in particular. The advent of the digital era, with the photogrammetry and the 3D laser scanning changed the way of recording and improved the quality of the acquired data. These played a very important role in the preservation of the cultural heritage as well and that is the case of the research conducted in the Susa Valley.

The development of the technology gave us the chance to readdress an important question within the field of the rock art and, at the same time, to propose new lines of investigation that so far were not practicable. The preliminary results in the Susa Valley suggest a complex situation of modification of the landscape within cultural practice that did not cease in the prehistoric times but went on during the medieval and modern times. Comparable examples can also be found in the western alpine region such as the cases of the Bessa Natural Park, the Chiusella Valley and the Po Valley. When the recording of all the engravings will be complete a more detailed and reliable scenario could be traced in order to understand the relationship between the environmental and the anthropic factors that shaped the Susa Valley and the western alpine region.

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