

Fifty Shades of Red:
The Connection of Red Material to the Elite and Supernatural in Pre-
Columbian Peru

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Figure 1: Cinnabar covered female head from Huaca Pucllana (CFA20 - 03(09)) [Author's photograph]

Abstract

The use of red materials in pre-Columbian contexts is an area that has had extremely disparate attention in South American archaeological studies.

This research is geared towards an understanding of the role played by red material in the ascension to and retention of high status position. It presents the idea that the presence of red material in the record can be indicative of ritual practices. It also shows that in a burial context, red material can be a corroborative diagnostic feature of an elite status individual, particularly a personage with great spiritual power in a society.

This thesis examines the relationship between red materials, the elite and the supernatural, showing how the association with the supernatural imbued red material with symbolic power that was then utilised by the elite to substantiate their own. 'Supernatural' is an umbrella term which incorporates environmental disasters, beliefs relating to the afterlife, and the worship of deities and ancestors.

This study initially looks at the way the colour red featured in pre-Columbian societies through an examination of cultural context and ideological belief systems. Combined with multiple accounts of the existence of red material in various archaeological contexts, this research indicates the need for further investigation into possible sources of red material and the significance of its use in ritual and elite contexts. The possibility of misidentification or oversight of red materials in these contexts until now suggests the need for more rigorous scientific analyses of red pigments in the archaeological record.

This study includes a range of samples from museums in the UK and Peru. Using specific organic 'spot tests' a variety of red materials were found in the samples provided, showing the variation present in even a small number of samples. These results highlight how more extensive scientific analyses are vital in order to pursue an informed investigation into the consequences of pigment use and acquisition, and the wider implications of the materials used in embalming.

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Declaration

I declare that this thesis is a presentation of original work and I am the sole author.

This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as references.

Collaborative work was undertaken with Dr Stephen Buckley, who provided training and expertise in the scientific analyses.

Introduction

This thesis seeks to use an in-depth examination of the literature combined with primary scientific analyses to prove that red material in the archaeological record represents the presence of elite influence. This leads onto a secondary aim: to address the lack of research and rigorous archaeological practice surrounding the use of red materials in the pre-Columbian Peruvian era.

The focal research question underlying the entire study asks: how did the ways in which red materials were used by the elite of pre-Columbian Peru build and reinforce elite power? This thesis argues that red material factored largely in the acquisition and retention of high status power through: association to the supernatural, important symbolism relating to the ideological systems of pre-Columbian cultures, and economical, political and practical factors.

In order to pursue the aims mentioned above, this thesis will focus on a number of objectives, building a repertoire of information that will inform the focal research question. These objectives seek to illuminate the way the elite built and reinforced power through an examination of the myriad factors that contribute to the topic where they can be identified in the archaeological record.

Although it is not possible to examine every aspect as in-depth as possible due to space limitations, the aims of this thesis are targeted through a comprehensive synthesis of the areas particularly relevant to the research question. Each of the aspects addressed in the first two chapters of this thesis are interlinked and the pursuit of a rounded understanding of each helps to recognise the way they impact one another and come together to inform the focal research question. This will be carried out through a detailed examination of the literature; through personal communication with researchers highly involved in the subject in both the UK and Peru; and information gathered from museums and first-hand experience of important archaeological sites in Peru, such as Huaca Pucllana, Huaca de la Luna and Huaca del Sol.

The following is a detailed description of the aims and objectives outlined above.

In order to explore the symbolic significance of red material this thesis will review the existing literature documenting the backgrounds of the cultures in question and the ideological systems responsible for the symbolism from which red materials drew their importance.

Numerous references to red materials in the literature has prompted the need for a greater understanding of which materials would have been available and how they might have been accessed. By looking at the biological and mineralogical properties of the red materials, this thesis seeks to highlight this overlooked but significant part of pre-Columbian society. The secondary aim of this thesis will be largely addressed by finding frequently mentioned and indigenous red materials that until now have not been collectively grouped for study. By doing so, this thesis hopes to shed new light on their importance and show how they were related to the status of those that controlled and used them.

Although the focus of these red materials will be a number of minerals used as pigments, consideration will also be given to the red shells of *Spondylus princeps* and *Spondylus calcifer*, with a focus on the former. This will also consider the symbolic elements of *Spondylus* that are not colour based, but which may have come to be associated with the colour through the shells. The correlation between the colour red and the supernatural (to be defined later in this chapter) will examine a number of examples such as the connection to the power and role of the sea through *Spondylus*. Combined with a review of the symbolic importance of water as will be presented in Chapter 1, this is then applicable to illustrate why red materials were used to convey supernatural powers and legitimacy to the elite.

Included also in this review of the red materials will be an evaluation of whether red pigments were used purely for the symbolic and prestige purposes, or if there is an element of practicality with regards to the preservation of high status remains.

The author believes that a large part of the value red material possessed was connected to how difficult it was to source the materials. This thesis postulates that the economic factor connecting red materials and the power of the elite lay in the ability of the elite to source the materials from far away, not only displaying the extent of the elite world, but also consolidating elite wealth from the exchange.

The idea that many elite served a spiritual role will be discussed, and that this role facilitated such exchange, often for ritual purposes between large ceremonial centres. In order to explore the long-distance sourcing and production chain of red material use, this thesis will use primary scientific analyses to back up research of the archaeological and ethnohistorical literature. By identifying specific minerals, and exploring the locations and natural occurrences of these, it will be possible to

draw some conclusions about the level of difficulty involved in their production and transportation.

Chapters 3 and 4 of this thesis aim to shed light on the necessity for more rigorous scientific analyses when it comes to remains evidencing the use of red pigment. Using samples sourced from individuals or objects with evidence of red pigment application, this thesis aims to discover what red pigments were used in these specific cases. This study will involve an analysis of samples from museums within Peru and the UK carried out by Dr Stephen Buckley and the author. This will be used firstly to address the first aim of this thesis, by supporting the argument for the link between the elite, supernatural and the colour red and thereby the use of red to consolidate elite power. Its function in achieving the secondary aim is to demonstrate the plethora of information that might currently be missed when a thorough analyses of red pigment is neglected.

As this study is trying to establish that red materials were linked to the elite and the supernatural, sourcing primary data to investigate lends weight to the argument. A number of the samples used are already confirmed as being associated with high status individuals due to the archaeological context. This analysis seeks to show that through detailed scientific analysis of red pigments we can further prove and understand this elite status by learning more about the pigments used.

It is noted and will be further discussed in this paper that a study of other materials deemed high status and used in combination with red pigment may further demonstrate the importance of the red pigment. Through personal communication (Buckley 2014) there is suggestion that resins in particular may have been combined with red pigment in application to high status remains. This holds a great potential for further analyses of red pigmented samples, in which it may be possible to further confirm the elite connotations through association with other elite materials (Buckley, Fletcher and Hinks, unpublished data).

From the first examples of mummification in the world on the Peru-Chile border c. 6000 BC (Arriaza *et al.*, 2005a), to the highly complex ritual practices of Inca royalty which continued until AD 1533, the use of red material prevails in both the archaeological and ethnohistorical record. Specifically examined in this thesis are *Spondylus* shell and the minerals haematite, cinnabar and realgar.

The term 'supernatural' is open to various understandings. For the purposes of this

thesis, the definition as stated by the Collins English Dictionary will be used: "of or relating to things that cannot be explained according to natural laws; characteristic of, caused by, or as if by a god; miraculous; of, involving, exceeding the ordinary; abnormal" (Anon 1.). To the ancient Andeans inexplicable events included environmental disasters of the land and sea – occurrences that to them might have seemed orchestrated by a 'supernatural' force. The term is also used in reference to the practices related to deity worship, and the veneration of *huacas*: objects or places imbued with a sacred value, including ancestor mummy bundles. Due to the space limitations of this study, it will not be possible to explore the details of the pantheon of each culture included here. The term 'supernatural' will therefore act as an umbrella term, despite the existence of specific deities, for example the Incan god Inti-Illapa who controlled rainfall (Ade, 1983: 775).

In a similar vein, the overarching term 'elite' is a term relative to the culture being considered. In some cultures this may just be an individual with particular spiritual power, and have nothing to do with political or economic power. In others, the religious and secular elite were one and the same. As the investigation discusses a number of cultural periods, a cultural chronology is provided in Appendix A for reference.

This necessarily constrained thesis will focus on South America and in particular Peru, although any such investigation of the use of red materials could be extended to include not only the adjacent Mesoamerican cultures (Reilly, 1989: 15; Cucina and Tiesler, 2006: 35; Manzanilla, 2002: 57) but indeed cultures spanning the world (Brooks, 2012). Although the geographical region of Peru is the focal area of study, it must be highlighted that the modern day boundaries have no bearing on the pre-Columbian region.

Since the use of red ochre (haematite) by the Chinchorro culture in the first examples of mummification in the world (Aufderheide, 2003: 192; Cockburn *et al.*, 1998: 158), other red material central to this thesis have been discovered with rich contextual symbolic and socio-economic associations. The relationship between red material and the elite is entwined, fortified by the power provided by religious acts involving blood and offerings over which the elite presided (Swenson, 2003: 257).

Occasionally there are examples of red material outside of an obvious elite context, including red pigment on human remains and examples of *Spondylus* in

other contexts. It is postulated that when examples like this are found they are diagnostic of a ritual context. These contexts are significant in relation to the control of red materials by the elite and therefore control of supernatural powers, reinforcing elite power. This would have been exercised over ritual proceedings, especially at large ceremonial centres.

The following two chapters seek to provide a thorough review and in-depth consideration of the extensive links of ritual practice and symbolism between the supernatural, red materials and the elite.

Chapter 1: Understanding the Cultural Context

In order to fully analyse the use of red materials in South America, this review of the existing research must necessarily be broad. This chapter will seek to examine the use of red materials in cultural contexts, investigating more deeply their role as symbols and prestige goods.

The initial part of this chapter will set out to examine fundamental ideological systems involving the symbolism of red. Such a foundation is necessary for a comprehensive understanding of the role of red materials and how they were used.

As there is a plethora of information about the ideology of each culture, here only those with substantial relevance to the role of red material and the elite will be discussed. Considering the symbolic significance of the use of red, this section will particularly consider the ritual practices involving the spilling and use of blood in ritual and the underlying ideology.

The study of funerary practices is based on the idea that most of the practices carried out in a society relate back to beliefs in an afterlife. These beliefs are materialised in the way the dead were treated. A large number of human remains are those that have been well preserved through special preparation, or easier to locate; for instance entombed within a monumental site. Those with the rights and resources to these luxuries were largely high status individuals, or sacrificial victims.

Part of the difficulty of understanding ancient religion is that the classifications of 'ritual' or 'religious' activities are dictated by present day concepts. Unfortunately, religion often exists within daily activities, and it is archaeologically difficult to separate from them. Post-mortem activities therefore often provide the best insight into the ritual aspects of the society by virtue of the societal perception of the afterlife, which itself impacts on day-to-day life.

1.1 Ideology

Ideology involves “the set of beliefs characteristic of a social group or individual” (Anon. 2.). Fundamental to this belief system is religion, and the way it influenced the activities carried out by the culture. The relationship between the beliefs of the culture, their practices, and the economic and political development of society is therefore co-evolutionary. The focus in this section will be upon those beliefs relating to the significance of spilling blood, the appearance of red material in iconography and myth and the influence of the supernatural.

Due to the lack of a literary record, the art of pre-Columbian cultures has been studied for decades in order to discern the workings of cultures through ceramics, textiles and architectural designs and motifs (for instance: Pillsbury, 2002).

Combining knowledge of religious tradition and ritual practices with ethnohistorical accounts and the archaeological record, we can gain some perspective of the ideological structure of certain cultures (Donnan, 1976). For the purposes of this thesis and the space limitations for this study, this section will examine certain themes that span several pre-Columbian cultures. A number of these themes evolve in the chronology of pre-Columbian cultures, and certain elements can be recognised as metamorphosing between cultural epochs.

The mortuary practices of a culture are one of the few ways the ideology and socio-political organisation of a past culture can be accessed archaeologically. By examining the methods of preparation, grave goods and differences between burials we can gain an insight into the social stratification and religious convictions of the culture (Binford. 1971). Caution must be applied when extrapolating evidence from these contexts, as the full complexity of the culture is unlikely to be fully conveyed by the archaeological record whether through lack of preservation or the involvement of archaeologically invisible practices.

1.2 Symbolism

1.21 Human and Animal Blood

The overview of ideology and ritual practices is tied together by a common theme, the role that blood plays linking the supernatural to the ritual practices carried out by the elite. Blood itself could be classed as a 'red material' in the context of this thesis, being used by the elite to build and retain power. However, more importantly here, the other red materials under study represent blood and the symbolisms it embodies. Blood is supplemented by these red materials as well as incorporated into ritual alongside them to reinforce the significance they held to the society and the position of the elite within it.

Blood is universally a symbol of life, and it doubtlessly held such an importance in these pre-Columbian societies. Life is encapsulated by blood in the act of conception, when the menstrual cycle ceases; in the act of birth and covering newborns; and in the act of violent death where blood is spilled to a fatal extent. According to Cobo "the most authoritative and important sacrifice was...human blood, but it...was only offered to the major gods and 'guacas' for important purposes and on special occasions" (Cobo, 1990 [1653]: 110-111). It therefore follows that in times of great crises such as catastrophic El Niño Southern Oscillation (ENSO) events that blood sacrifice would occur. It would have been the responsibility of the elite to carry out these offerings, and by doing so they would have demonstrated and maintained their social position and authority.

The utilisation of blood in ritual is recorded ethnohistorically. While it is necessary to be cautious when using ethnohistorical work considering the bias that might pervade the writing of colonists, these sources can be considered as more reliable when they substantiate one another and are backed up further by the archaeological record. Xérez (1972[1534]) describes how blood was used to anoint idols in entrances to temples and sepulchres of the deceased. A similar example is the ritual feeding of the dead in a process where blood was daubed upon them (Classen, 1993). Classen describes blood as "a symbol of passage and transition" (1993: 124) used in transitional and sacrificial rituals as a body paint. It is noted also that red material was used in a similar fashion, for use upon ritual objects and decoration of the body. The role of blood as a symbol of passage is particularly relevant for cases of red material used as a symbol for blood in mortuary contexts, in order to facilitate the transition from this life to the next.

The spilling of human blood for every rite however would be profoundly unrealistic and so the sacrifices of animals were often offered as an alternative. On a lower level than human sacrifice was that of animals such as camelids, deer, dogs and guinea pigs (see Fig. 2 below) (Swenson, 2003: 288; Cockburn *et al.*, 1998: 161). A prominent motif of Moche iconography is the deer hunt, which has been likened to the Sacrifice Ceremony (Donnan, 1997).

Spondylus could also be deemed an animal offering, however it would more likely be long deceased and perhaps even in a worked state before it reached the point of becoming an offering. Upon the sacrifice of *Spondylus* shell, no blood was spilled from the shell, and thus it was not a blood offering in the same way as the other animal offerings. The offering of *Spondylus* in its many forms was symbolic of blood through its natural colouring, but was not by any means single faceted in this act.



Figure 2: Guinea pig with throat cut found in association with child burial (Sandweiss and Wing, 1997: Fig. 6)

1.22 Water and Fertility

Blood has been depicted as a metaphor for water and thus the spilling of blood invokes the flow of water in rituals for fertility (de Bock, 2005). Water and blood are linked through their associations to fertility and rejuvenation of the body and land both serving a crucial function in agriculture and in the expansive mythology of many pre-Columbian belief systems (Jackson, 2008: 24, 36; Silverman and Proulx, 2008).

Large expanses of water such as Lake Titicaca or the Pacific Ocean were particularly revered, being seen as the conduits through which the ancestors were reborn. Large-scale fertility rituals would have been in the power of the elite, for which red materials could be used in place of blood to act as an offering for fertility, as it represented by the same symbolism. For instance, the elite would have sourced *Spondylus* to be used as offerings for fertility and rebirth (Blower, 1996: 33), such as shell scattered in fields. This is demonstrated in the La Poza area of Huanchaco in the Chimu phase, where *Spondylus* was found in a worked field (Pillsbury, 1996, citing personal communication with Genaro Barr). Water contexts also show this kind of deposition, such as offerings of *Spondylus* to wells (Burger, 1992: 130; Murra, 1975).

Both Cobo (1990: 51, 117 [1653]) and de Acosta (1962: 246-247 [1590]) relate the focus of seashells used as sacrifices in agricultural and fertility rituals. Therefore it is possible that *Spondylus* was used for the other symbolisms it held, specifically those relating to the sea and water directly. It is documented that *Spondylus* still continues to be used in rituals for agricultural fertility by indigenous peoples (Pillsbury, 1996: 318). However, it is postulated here that the use of the shell can also be attributed at least in part to its red colour and connection to blood and thus water and life.

Iconography also contains other fertility themes, exhibited in the Paracas textiles recovered from the Wari Kayan Necropolis. Notably in this example is the use of sprouting plants to indicate rebirth, an image intertwined with images of decapitated limbs, or acting as umbilical cord-like representations of severed heads (Frame, 2001: 69-72). It is reasonable to infer from these images and the aforementioned symbolism, that the practice of ritual sacrifice was an act intended to prompt the cycle of death and rebirth in nature for the good of the society.

The regeneration properties of the red sponge believed to grow on the shell further supports the concept of *Spondylus* as a symbol of rebirth. This is reinforced

by the similarity of the morphology of the *Spondylus* to female genitalia and acts involving blood: conception with the cessation of the menstrual cycle, and childbirth.

Other natural events may tie in to the connection of *Spondylus* to water and blood. For coastal populations the symbolism of *Spondylus* may largely have been as a representative of the power of the sea and perhaps the occurrence of events such as 'red tides'. The term 'red tides', more accurately known as a harmful or non-harmful algal bloom, are caused when there is a sudden increase in algae in salt or fresh water. The algae are known as dinoflagellates, which have photosynthetic properties and in some cases cause the water to take on a red colour (Anon. 3.). Such an event, especially in combination with catastrophic ENSO events, could have impacted the belief systems of cultures affected by it. As these events may potentially have been heralded or joined by the *Spondylus* shell, it is possible it could have been seen as a harbinger of natural disaster. This connection will be discussed later in this thesis in a more in-depth appraisal of *Spondylus*.

The El Niño Southern Oscillation (ENSO) is the broad term that encompasses both El Niño and La Niña phenomena, which occur in cycles every few years (in the modern day) and is, simply put, the result of interaction between the ocean and the atmosphere. El Niño refers to the warming of waters, in this case along the coast of Peru, to above average sea-surface temperatures, whereas La Niña is the opposite; the cooling of water below average sea-surface temperatures. (Anon. 4.)

Other red materials included in this thesis, in the form of red pigments, also hold symbolic value through their association with the earth. These pigments would have been mined from the landscape, and were perhaps regarded as the blood of the earth itself and thus considered extremely sacred. Application of red pigment to the deceased is often believed to symbolise the blood of rebirth into the afterlife. Once again, this will be focused upon in more depth in the chapter on the red pigments themselves.

1.23 The Sun

It is a common element of many cultures to attribute a sacred significance to the sun. In ancient Peru, as a source of life and fertility, sacrifices were made to the Sun. (Benson, 2001: 13).

During the reign of the Inca Pachacuti, Sun worship was officially introduced. The Inca people became known as 'Children of the Sun' and the Incan Empire as 'Lands of the Sun'. This is not to say Sun worship did not exist before this time, simply not on such a national scale (Spence, 1926: 406-407). The Sun god Inti in Inca mythology became their most revered God, from whom the Inca rulers were descended. Inca's "celestial father, the sun" (Chasteen, 2001: 31).

Coricancha, the Temple of the Sun in Cuzco, and Pachacamac near Lima are both outstanding examples of temples to the sun involving dedicatory sacrifice and preparation for sacrifice elsewhere, such as the *capacocha* ceremony (de Betanzos, 1996: 46-47; Benson, 2001: 15).

It is noted here that the colours of the sun in its cycle, moves through shades of red, thus the colour red defines the death and rebirth of the sun each day. Similar to this colour range is the variation of colour in resin, ochre and arsenic. All three vary on the yellow to red scale however the red is what is evidenced most widely and in the most important contexts in the record.

Yet again we see the relevance linking supernatural powers, in this case the power that moves the sun and turns night to day. This embodies a further example of death and rebirth, mirrored in the pigments utilised by the Andean elite with red as the most important colour. The use of red pigment when applied to deceased remains may be seen to imbue the individual with the properties of this supernatural force. This would be a practice reserved for the elite to signify their status and connection to supernatural powers.

1.3 Ritual Practices

~ "To sacrifice is to make sacred" ~ (Benson, 2001: 1)

By analysing the ritual practices of pre-Columbian cultures we can examine several aspects that impact upon the overall importance of red material and the context for its use. In this particular study, ritual practices include offerings, human and animal sacrifices, and ritual warfare where red was the blood spilled as an offering to higher beings on the battlefield (Tung, 2007; Quilter, 2002; Arkush *et al.*, 2005; Proulx, 1989). As is apparent from the list above, of particular interest here are ritual practices revolving around the use of red material and violent acts involving the spillage of blood, especially decapitation and dismemberment (Gaither *et al.*, 2008; Hill, 2003). These acts form a basis for the linking of blood to the elite and their power, and thus for the colour red to be representative in other contexts. The following review of the position held by the elite in relation to the spilling of blood and the context for such acts reinforces the role played by red materials in other contexts.

In the pre-Columbian Andean world the decapitation theme was a common one (Proulx, 2001; Cordy-Collins, 2001a) and was related to the practices of ritual sacrifice and blood letting (Conlee, 2007). The decapitator (Fig. 3) is commonly represented in painting and sculpture holding a severed head and a *tumi* knife – a bladed instrument reserved for the ritual. Such *tumi* are frequently found in high status tombs, often bearing depictions of warriors in full regalia, ritual combat or prisoner sacrifice (Alva and Donnan, 1993: 96) (Fig. 4). Verano describes how decapitation at the hands of a supernatural being seems to be “the quintessential signifier of ritual death in the Andean world” (2001: 172). The gods themselves vary throughout the ages of pre-Columbian Peruvian culture, with each culture adopting or discarding various elements of previous pantheons and creating new deities. It will be discussed further, the key role the elite took in these ritual acts – as those in control of the ritual or as the decapitator itself. Here we see how the elite take on the position of a god in the decapitation ceremony, imbuing them with the power of the gods. Importantly, this act would likely have involved liberal spillage of blood. The blood in this context signifies the gods’ – and elite’s – power and status. A number of illustrations and objects (Figure 3) suggest the collection of blood, possibly for the elite to consume.

In the case of the Cupisnique (Early Chavin) illustrations, the pantheon includes a number of 'supernatural head takers' or decapitator gods (Cordy-Collins, 2001a). Those undertaking studies of ceramic art were struck by the similarity between the Cupisnique decapitator pantheon, and that of the following Moche tradition. The relationship between Cupisnique and Moche portrayals of certain gods was originally classified as the Moche having archaized the original Cupisnique art (Cordy-Collins, 1992). Contrary to this, it has been argued that the five decapitator gods shared by the two cultures represent a continued tradition, where the symbolic meaning behind the images was transferred, while the images themselves changed to a Moche-style representation. As described by Cordy-Collins the Moche "were heirs to a belief that they subscribed to in practice" (1992: 218). The cult of the Decapitator is a theme in the Cupisnique, Paracas and Chavín, preceding the Moche, and also exists in the Moche coeval cultures of the Nasca and Lima. Furthermore it continues on after into the Wari, Chimú, Sicán and Inca cultures (Proulx, 2001). This continued focus upon the act of decapitation and blood demonstrates the significant factor of blood in the ideological systems of a high number of cultures, and the survival of the elite role in the process.



Figure 3: Decapitator god holding a human head and wielding a *tumi* knife (Proulx, 2001: Fig. 2)



Figure 4: Moche sacrificial cup and *tumi* knife (Museo Larco, Lima) [Author's photograph]

Although many ritual acts are rooted in a religious basis, their purpose is often political. Public ritual acts serve to reinforce the power of those already elevated above others (Kertzer, 1988; Hastorf, 2001), such as the *capacocha* ceremonies of the Inca Empire (De Molina *et al.*, 2008 [1575]; Andrushko *et al.*, 2011). What can be widely assumed is the power the elite had over sacrificial activities. The *capacocha* ceremonies for instance, were undoubtedly a way for the ruling Inca to exercise their power and ensure the loyalty of the more outlying areas of Tawantinsuyu.

One of the most famous *capacocha* sacrifices is the female dubbed 'Juanita' found atop Cerro Ampato in southern Peru (Reinhard, 1997; 1999), who was found with a *Spondylus* figurine. Another site however, boasts both adult and child sacrifices, as well as a cache of ritual objects dating to AD 1410 – 1520. At the site of Choquepukio, Cuzco Valley, six human adult remains were uncovered beneath an imperial building as secondary burials, alongside which six primary burials of children were found. These children were buried with a variety of rich burial objects including *Spondylus*, whilst artefacts discovered with an additional child buried nearby included a silver figurine adorned with a *Spondylus* headdress (Gibaja *et al.*, 2005). The figurine was additionally surrounded by other carved *Spondylus* objects (Andrushko *et al.*, 2011: 325). These sacrifices played a crucial role in Inca conquest and control of distant territories by marking the political and sacred expanse of the empire (Ceruti 1999; Andrushko *et al.* 2011; Wilson *et al.* 2007).

The movement of the children to Cuzco, and back to their homes to be sacrificed evokes the idea of "Cuzco as the sacred heart of the Inca Empire, with a circulatory system of veins and arteries through which blood flowed metaphorically and literally" (Duviols, 1976: 29). The political power of the Inca was pumped around Tawantinsuyu through the blood of sacrificed children, enforcing social control and keeping the more distant regions under the Inca aegis. The specification that "some of these should be the children of *caciques* (chieftains)" (de Betanzos, 1996: 132) emphasises the purpose of confirming the allegiance of all areas of the domain.

Sacrificial accompaniments appear frequently in elite tombs. This form of sacrifice does not necessarily involve blood rituals, however this thesis would argue that the red materials often found in context with or on the individuals represent the same symbolic traits as blood. Ritual practices involving the spilling of blood or opening of the body have particular precedence of interest in this thesis. An exemplary case

of this is evidenced at the Late Horizon Inca site at the Temple of the Sacred Stone, Tucume. Toyne gives an osteological deduction of the sequence of human sacrifice events, including decapitation, opening of the chest cavity, and cutting of the throat (Toyne, 2011: 514). One third of the remains of 117 human individuals found on the excavated platform evidenced all three of these acts. These sacrifices began during the Chimú occupation of the site, and continued during the subsequent Inca occupation (Toyne, 2011: 510). It is possible that this was a recurring fertility ritual fitting well into the cyclical patterns of cultivation of land (*ibid*: 520).

Most renowned in Moche imagery are representations of the Sacrifice Ceremony, depicting the rite where prisoners of ritual warfare were stripped naked and bound and their weapons taken as bundles of trophies before they were sacrificed (Alva, 1994; Alva and Donnan, 1993; do Nascimento, 1976) (Fig. 5).



Figure 5: Fineline drawing of prisoner capture (Sutter and Cortez, 2005: Fig. 2b)

Iconography such as the Presentation Theme (Fig. 6), the most complete illustration of the ceremony, contains motifs of these exposed prisoners followed by depictions of bloodletting in which the throats of prisoners are cut by figures holding cups (Fig. 6: A) (Toyne, 2011: 517). Later in the depiction a cup is offered to a principal personage (Fig. 6: B), as previously mentioned, supposedly for consumption (Quilter, 1997: 116; do Nascimento, 1976). This echoes the idea that ritual sacrifice was very much controlled by the elite, and these ceremonies involving the spilling, and possibly consumption of blood served to reinforce their spiritual power. There are several repetitions of this motif in other pieces, for example on ear ornaments (personal observation: Museum of the Royal Tombs of Sipán) and in other pottery depictions. These images have been used by experts to make such assumptions about the ritual activities of the Moche for a considerable number of years.

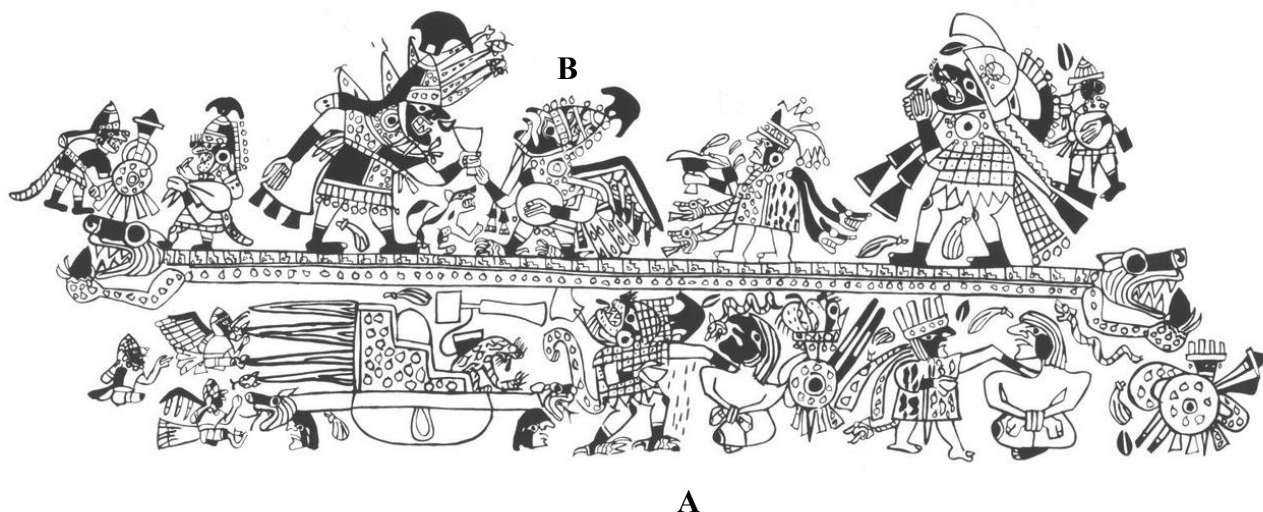


Figure 6: Fineline drawing of the Moche Presentation Scene (Hastorf, 2003: Fig. 4)
 [Note the collection of blood at A and the offering of the cup to the “Warrior Priest” at B]

The Sacrifice Ceremony reveals the use of blood in a ritual performance linked to the capture, subjugation and sacrifice of prisoners. The renowned “Presentation Theme” depicting the ceremony shows cups being used to collect the blood of prisoners as their throats are cut (Fig. 7 and 8), which seems to be given to the Warrior Priest, supposedly to consume. In this ceremony “only certain individuals had the right or privilege to accept the sacrificial blood reflecting elite control of ritual offerings” (Toyne, 2011: 507) with the possibility that they served as a conduit to pass the highest gift of blood to higher beings. This confers a sacred power upon the elite, heightening their spiritual status as they act for the living receptacles for gifts to the gods.



Figure 7: Prisoners bleeding while sacrificers collect the blood in goblets (McClelland, 2008: Fig. 3.14)



Figure 8: Drawing of a figure holding a goblet and *tumi* knife (McClelland, 2008: Fig. 3.20)

Seventeenth century documents are referenced by Rostworowski (1996: 9-11) on the ritual feeding of *huacas* – a focal reason for the performance of offering and sacrifice in the ancient Andean region, with blood as the highest offering.

Ethnohistorical accounts can provide an idea of what offerings to *huacas* may have involved. The testimony of the priest Pedro Quiñones in 1724 depicts the rites carried out for the *huaca* Libiac Cancharco. The blood of llamas and cuy (guinea pig) as well as human blood were offered, and Quiñones also mentions ground seashell mixed into chicha (corn beer), which could potentially be *Spondylus* (Mills, 1997: 68).

Interestingly a particular fruit is depicted in the two most complete illustrations of the Sacrifice Ceremony. *Ulluchus* have been said to possess particular properties of anticoagulation (Hultin *et al.* 1987), which led to the intriguing conclusion that it may have been used in the Sacrifice Ceremony to facilitate the use of blood, preventing it from clotting once it had been drawn from the victim. This idea sprung from the classification of the *ulluchu* by Professor Wassen (1987: 66) who proposed it was papaya (*Carica candicans*). Studies of the enzyme papain found in the fruit by Hultin and colleagues revealed anticoagulation properties (Hultin *et al.*, 1987). Images of the *ulluchu* occur commonly in Moche art, often simply as an addition to the scene, or as whole trees with the fruit suspended from the branches.

Although we cannot be sure this is the case, until the *ulluchu* is properly classified it is not unreasonable to postulate that it is papaya, or may belong to the papaya family, with the possibility of sharing the anticoagulation properties. If such properties were to be confirmed, it would lend credence to the images depicting the consumption of blood in sacrifice ceremonies on Moche ceramics.

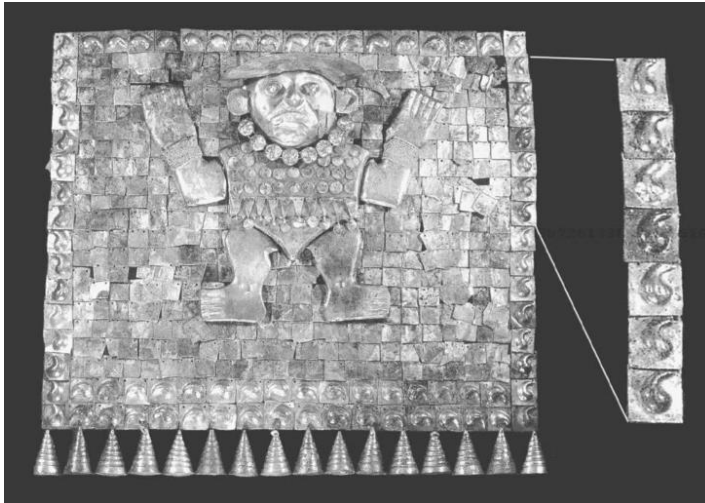


Figure 9: Banner depicting ulluchu around the border beneath which the actual fruit were placed (McClelland, 2008: Fig. 3.36)

Following a tomb robbery at Sipán, Lambayeque, excavations have unearthed evidence to corroborate the assumptions that such ceremonies were carried out by the elite. At the Royal Tombs of Sipán, two of the three tombs are postulated to contain elite personages displaying the regalia of two of the four principal “priests” from the Sacrifice Ceremony (Alva and Donnan, 1993: 138, 163). The significance of these finds is amplified when the treatment of the deceased elite themselves is considered. These individuals, with clear links to the high status figures in the Sacrifice Ceremony depictions, were found painted with red pigment.

The individual discovered in Tomb I, believed to correspond to the “Warrior Priest” was found amongst dozens of objects depicting images of the capture, subjugation and sacrifice of prisoners (Alva and Donnan, 1993: 97, 120; do Nascimento *et al.* 2001: 12).

Within the excavated tomb, dozens of small objects indicated the focus on the ritual practices previously mentioned; necklaces comprising tiny, skilfully carved decapitated heads; ear ornaments depicting miniature warriors in full regalia; a captured prisoner scene carved onto the handle of a sceptre; two *tumi* blades of gold and silver (do Nascimento *et al.* 2001: 12).

On a grander scale, the walls of the tombs were decorated with low-relief depictions of warfare and the capture and subjugation of prisoners (Alva and Donnan, 1993: 97), and within the burial was a colossal horde of ceramics, upon many of which were representations of nude, bound prisoners, or of armed warriors. The ceramics were unused and therefore likely produced en masse solely for inclusion in the burial (*ibid*: 120). These grave goods illustrate not only the high

status of the individual in the tomb but, as mentioned above, indicate the occupant's role in the Sacrifice Ceremony.

Examination of the Tomb I remains revealed red pigment application to the face of the individual. The description of the skull shows that there were "traces of red pigment adhering to the frontal bone of the skull and around the eye orbits, [this] indicated that the deceased was wearing red face paint at the time of burial, a custom that has been noted in some other Moche burials..." (Alva and Donnan, 1993: 91).

Following the discovery of the "Warrior Priest" in Tomb I, the contents of Tomb II brought forward yet another contender for an elite individual with a ritual role in the Sacrifice Ceremony. The occupant of Tomb II was surrounded by and adorned with diagnostically lavish objects and sacrificial accompaniments, as in Tomb I. An examination of the inventory of the tomb revealed objects supposedly relating the occupant to the "Bird Priest", in particular an elaborate owl headdress and warrior's backflap.

Although the third tomb at Sipán has not been postulated to hold one of these ritual roles, it is undoubtedly an elite tomb with a vast array of iconography relating to decapitation and ritual sacrifice. Alva and Donnan argue that as Tomb III is earlier than the other tombs it illustrates the development of the ritual beliefs and practices of this Moche polity (1993: 215). This idea is based on the fact that no representations of the Sacrifice Ceremony exist before A.D. 300 – the date of the first two tombs – therefore the characteristic features of the ceremony and its participants may have only developed subsequent to the construction of Tomb III (*ibid*: 217). Despite this lack of representation of the Sacrifice Ceremony, evidence of decapitator gods, trophy heads, warrior figures and human and animal sacrifice are present in this earlier tomb. It could be argued that the iconography and objects present in the tomb reflect an ideological system that stretches through the pre-Columbian era.

Of direct consequence to the use of red materials in this form of context, Tomb III exhibited the use of red pigment applied to the floor beneath the deceased individual. Additionally, all three of these contexts included both elaborately worked and unworked *Spondylus* shell and the individuals from both Tombs I and II were wrapped in a red textile.

Further excavations at the site of San Jose de Moro approximately 50 kilometres away in the Jequetepeque Valley revealed a tomb very similar to Tombs I and II at Sipán, dating to c. A.D. 550. The female interred there known as the First Priestess

is suggested to have carried out the role of the “Priestess” in the Sacrifice Ceremony. Moreover, more than one of the supposed Priestesses uncovered elsewhere at the site was found with the valves of the *Spondylus* shell in their hands (Cordy-Collins, 1999). This direct association with the red shell, for reasons to be discussed later in this thesis, is suggested here to be indicative of elite wealth and influence.

The idea proposed by Alva and Donnan is that the Sacrifice Ceremony would have been incorporated into a “state religion” where the elite rulers of a polity would perform this ceremony and then be buried with the accoutrements upon their death. From this, it can be said that these leaders and the ceremonial centres they controlled would likely be linked, especially in those cultures that expanded dramatically over vast areas such as the Wari, Tiwanaku, Chimú, and Inca.

Demonstrated here is the relationship between the elite, of which these individuals were likely of the highest level, and the use of red pigment to signify their power and symbolise their passage into the afterlife.

In scenes depicted on the Moche temple of Huaca de la Luna, near to the present day city of Trujillo, impressive images of a procession of war prisoners, naked and bound, decorates the outer wall (Fig. 10). From a slightly later area of the site, burials of individuals between 15-35 years of age further emphasize the performance of ritual warfare in the area. Within a site boasting this and other archaeological evidence to back up the performance of ritual sacrifice (Bourget, 2001: 94), the record and art corroborate one another. Also within this site excavated in 1995, were some seventy individuals buried within fifteen strata, revealing what Bourget concludes were at least five ritual events, with two of these episodes relating to cases of torrential rain (Bourget. 2007: 198). This makes the likelihood of the sacrifices as an offering due to the effect of these events very high. The elite that would have had control of a ceremonial site as monumental as Huaca de la Luna and nearby Huaca del Sol would have undoubtedly have presided over such warfare and ritual sacrifice. In the case of the above repeated episodes of ritual sacrifice, the elite would have been connected to the supernatural powers through the supplicatory bloodletting.

Although the Moche are renowned for their heavy emphasis on sacrifice and proliferate use of the theme in iconography, other cultures with a less well documented use in art are nevertheless revealed to have widely practiced decapitation and bloodletting in the archaeological record.



Figure 10: Mural depicting the binding of prisoners at Huaca de la Luna [Author's photograph]

Evidence for the direct use of *Spondylus* in ritual sacrifice contexts has been recovered from artwork produced by the Paracas culture. Examination of the Wari Kayan Necropolis textiles by Frame has revealed them to contain images of what is described as “backbent figures” (2001:63-64). These figures are seen in states of sacrifice, auto-sacrifice, displaying wounds with a focus upon blood and fertility themes. Included among these is a backbent figure with a *Spondylus* shell protruding from the stomach region. Another is shown with two chest wounds, above which a second figure holds a *Spondylus* shell.

In relation to these scenes, it has been noted that some Mayan practices involved the use of *Spondylus* shell in ritual bloodletting ceremonies specifically carried out by high status women (Taylor, 1992: 522). We can relate this to the association of *Spondylus* with female attributes (e.g. genitalia) as well as the shells discovered with the Priestesses at San Jose de Moro.

The position of the elite meant that they had a responsibility to fulfil the religious and ritual needs of the society; failure to do so would likely have impacted the solidity of their power. In some cases, the elite would be classified as simply the most spiritually powerful individuals such as shamans who would use hallucinogens to enter otherworldly states in order to communicate with the supernatural (Saunders, 1999: 226). There is indication that such individuals counted red materials as part of their ritual paraphernalia. For instance, at the Late Archaic Period site Kilometre 4 on the coast of southern Peru, were finds that relate to an individual of special status and in association with red pigment. Comparison with contemporary burials in the area reveals the burial to have a much larger and more varied collection of burial goods. The authors mention that, though further research would be needed for confirmation, in comparison to

contemporary burials the individual at Kilometre 4 appears to be high status (Wise *et al.*, 1994: 225). What sets it apart however, is the evidence for the use of hallucinogenic drugs, indicated by a set of drug-taking instruments. In association with them, is what appears to have been a hide bag containing the remnants of a red pigment (specimen 202-7A and 202-7B) (Wise *et al.*, 1994: 224). Contextually related to this was also a wad of what the authors describe as “ochre-stained animal fibre” (*ibid*). No evidence of tests to confirm this pigment as haematite, or identification for the other red pigment in the bag is given.

Through the performance of rituals during which hallucinogenic materials might be used to access supernatural realms, these elite reinforced their spiritual power. Red material may have been involved as ritual paraphernalia, as found at Kilometre 4, or perhaps consumed. This has interesting implications when considering the postulated ritual consumption of blood by the elite, and feeding of the ancestors with red materials.

The evidence presented here provides a glimpse into the ritual practices carried out in pre-Columbian periods. It details how elite control of ritual sacrifice was a way of exercising and consolidating power. In the above examples from Sipán, Huaca de la Luna and San Jose de Moro, we can see how red material was used in an elite burial context with connotations to the Sacrifice Ceremony. It would also have been part of the elite responsibility as leaders to carry out ritual acts for the sake of the society and perhaps to enter otherworldly states through hallucinogens in order to converse with the supernatural. .

An investigation of the foundational symbolism is key to understanding why the sacrifice and use of blood and red materials was so important.

1.4 Conclusions

There is clearly a considerable role of the colour red in the ideological systems in the region of pre-Columbian Peru. With such a strong basis of the colour in the more abstract facets of society, the question that arises is: did this ideological inclusion of red materials manifest itself physically? Noted in several references in the above section, this thesis argues that it did, and that the use of this colour was representative of supernatural and elite power. This clearly poses questions about what materials were used to produce the colour that represented supernatural and elite status. The focus will be mainly upon the pigments used by the pre-

Columbians, which will be examined in the scientific analyses section of this thesis. However, there is also discussion of the red *Spondylus* shell, frequently included in many important sites, with its own host of symbolic meaning.

Chapter 2: An investigation into frequently occurring red material in Peru

Having outlined the significance of the use of red as a symbolic colour, this study will further explore the nature of the red materials used and possible source sites. The materials will be explored in great depth, detailing examples in the archaeological and ethnohistorical record and their relevance. The investigation into the incorrect or lack of red pigment identification in South American archaeology will follow in the first hand analyses included here.

In assessment of this information, this section will lay the foundations in order to later clarify the role of the elite, supernatural and red material.

Following on from the in-depth review of red symbolism in pre-Columbian ideological systems, this chapter seeks to give an overview of a number of potential candidates in terms of red materials that might have featured in the corporeal aspect of pre-Columbian society. These materials have been chosen due to either high rates of inclusion in ritual and status contexts and evidence for their existence in the geographical region under study. Moreover where there are examples of those materials being mined and transported. This will also include looking into possible sites from which these materials were sourced and the implications of their distance from examples in the record. An examination of ethnohistorical texts also reveals indications of the use of such materials, supporting the use of, and occasionally the context for the use of certain materials.

A majority of these materials are pigments. Red ochre, or haematite, is the most commonly found red pigment documented for South America. However, more unusual red pigments do exist. As there is evidence for the presence of these more rare pigments, which will be discussed in the following section, there is also the possibility of their misidentification.

The identity and extent of use of red pigments in pre-Columbian societies has thus far been somewhat overlooked, with the focus being mainly on the precious metals and art, or occasionally individual cases of extensive red pigment use. This thesis hopes to draw attention to these neglected aspects of the manifestation of pre-Columbian ideological systems.

2.1 Red Ochre/ Haematite

Haematite – “Blood” (Greek)

~ “The essential thing is, that these burials were made in unknown times of high antiquity and by a peculiar people. Why such quantities of ochre were placed in every grave, passes understanding. It seems to me that to the mind of the aborigines the ochre was more than mere paint. If it were considered as paint and nothing else, far smaller quantities would have sufficed. Possibly we have, in the presence of these bushels of powdered haematite, evidence of some unknown ceremony or custom” ~
(Peabody, 1927: 207).

Perhaps the most prolific of red colorants used around the world in prehistory, red ochre is a natural pigment comprised of anhydrous iron oxide, deriving its red colour from the mineral haematite (Fe₂O₃). The use of red ochre dates as far back as early *Homo sapiens* at Blombos Cave c. 100,000 BC (Henshilwood *et al.*, 2011: 219) and was used even by *Homo neanderthalensis* c. 200- 250,000kya at Maastricht-Belvédère, The Netherlands (Roebroeks *et al.*, 2012: 1889), for supposed symbolic functions, although the certainty of this remains unknown. It is perhaps unsurprising then, that its use is in evidence from the very early societies of what is now coastal Chile and Peru.

The Chinchorro culture, whose territory covered the coastal region between what is now Ilo in southern Peru and Antofagasta in northern Chile, are renowned for their implementation of highly complex artificial mummification practices beginning c. 7000 BC (Cockburn *et al.*, 1998: 158). The culture dates to a much earlier period than many of the other cultures examined here, existing between 7020 BC and 1110 BC in the pre-Ceramic period (Arriaza, 1995a).

The use of red ochre in their mummification practices did not appear until somewhat later in the culture’s timeline, following on from the extremely elaborate ‘black mummy’ technique (c. 2,685 – 2,090 BC). The evisceration and desiccation of those individuals treated with the ‘red mummy’ technique is an exceedingly specialised method. This involved the use of sticks and various vegetation and materials to support and ‘pad out’ the body, before painting the face and majority of the body using red ochre. The facial preparations used are described as being more complicated than that of any other form by this culture (Arriaza, 1995a: 45).

Analyses using X-ray fluorescence carried out at the Winterthur Museum Analytical Laboratory by Janice Carlson have confirmed the identification of the red pigment as iron oxide (Arriaza, 1995b: 107). It is also worth considering that the technique would have involved the removal of blood, whether as part of the process or possibly during sacrifice rituals.

This thesis suggests, contrary to some academic opinion, that the existence of these elaborately mummified individuals indicated that this society was not egalitarian. This idea will be explored further in the discussion chapter of this thesis, where the ideas of possible elite kin-groups and ritual relating to the impact of ENSO events will be looked at.

Red ochre clearly holds a deep importance, and in this initial context could have related to the elite the way it certainly did in later cultures. The pigment was used for elite objects, iconographic representation, textiles, ritual deposition and body paint. An example of the latter was found in the Initial Period Burial LVIII at Puémapé, where a high status female with a haematite painted face was discovered. Red pigment was also found in bowls buried above and below the individual, and evidence for haematite grinding and ritual performances was discovered in the Cupisnique Grand Temple at the site (Elera, 1993: 250). He describes the local access to the iron oxide, in the Cerro Azul.

Due to the fact that ochre was used more often for what were potentially more practical or aesthetic reasons (Fig. 11), material such as *Spondylus*, which seems to have a more focused significance, could be argued to be more important ritually.



Figure 11: Nasca polychrome bowl with use of haematite for red colouring (Vaughn *et al.*, 2007: Fig.1)

2.2 Cinnabar/Mercuric Sulphide

~ *Zinjifrah* – “*Dragon’s Blood*” ~ (Persian)

Although the occurrence of red ochre is perhaps more frequent in the record, cinnabar would appear to be the more commonly used pigment for body or artefact paint (see Shimada and Griffin, 2005: 83; de la Vega, 1991: 555-556; Silva and Bahamondes, 1969; Llagostera *et al.* 2000). However, accurate identification of the pigment used is contested in this thesis due to lack of scientific analysis of excavated pigments.

Otherwise known as vermilion, bright red cinnabar is scientifically known as mercuric sulphide (HgS). Geologically the presence of cinnabar is related to environmental states common in the Andean region, such as volcanic or igneous activity, particularly associated with alkaline hot spring occurrence (King, 2002: 195). Several areas in Peru could have been sources for mining this material, however this is a topic of research that has not been extensively pursued. The largest known cinnabar mine in South America was located in Huancavelica, where the deposits of the mineral spread over 30 square kilometres (Burger and Mendieta, 2002: 165). Following the exploitation carried out by indigenous people, the Spanish invaders took over the mining of the site. There is documented evidence for several smaller sites found when the Colonials branched out in the effort to fuel their silver production – reliant upon the mercury from Huancavelica (Berry and Singewald, 1922). Although none of these sites reached the scale of Huancavelica, this record informs the opinion that there would have been many other sources in the Andean region that pre-Columbian societies may have utilised. Unfortunately due to the Colonial exploitation of the mines at Huancavelica it is hard to analyse the pre-Columbian use archaeologically, but records from the time of the Spanish overthrow attest to its state prior to their arrival (de la Espada, 1965). In addition, recent studies by Cooke *et al* (2013) have used isotopic tests on red painted pre-Inca artefacts to show that the cinnabar was sourced from the Huancavelica mines. This is a perfect example of the type of analyses that are needed in the scientific study of red pigments, so that it will be possible to locate the source of more pigments used by the pre-Columbians. Many of the outstanding instances of cinnabar use in ritual contexts date to the Moche, Chavín and Sicán eras.

Following the interlinked relationship of red with the elite, a study conducted by Shimada and colleagues (2004) examined the site Huaca Loro. Here they explored the idea of the social status of a buried individual being stated by how far the burial is located from the sacred centre (Shimada *et al.*, 2004: 371): the closer they were situated to the supernatural, the higher their status. The tombs examined included exceptional examples of cinnabar and also *Spondylus* use.

In this case, the burial of the individuals identified by Shimada and colleagues as being the principle personages of the site display an extensive use of cinnabar. The face of one principle personage (Fig. 12 below), and the entire body of the other was painted with the pigment. On top of this, the tombs also contained the bodies of women, and a male youth also treated with cinnabar on their faces, which were included supposedly as offering or accompaniments. The women and youth together in the west tomb all shared the treatment of cinnabar on their faces. It is suggested that the arrangement of the east tomb is representative of rebirth, with the full body paint on the principle personage standing for the “life-giving, well oxygenated blood and the blood that often accompanies birth” (Shimada *et al.* 2004: 387). In previous work Shimada has discussed the arrangement of bodies into the foetal position and this pose as a portrayal of rebirth, as illustrated by the inverted position of the east tomb principle personage (Shimada, 1995: 145).

This is an excellent example of the differential spiritual treatment of high status individuals, combined with the application of red pigment to the deceased.



Figure 12: Red pigmented skull of the West Tomb principle personage. MNAAH, Lima
[Author's photograph]

A further case of mortuary cinnabar use is presented in the findings of Benavides (1991). In his work Benavides describes the mortuary findings from the excavations at Cheqo Wasi, Huari, where a minimum of one hundred skeletons

have been excavated. Most interestingly, these bones are described as “frequently stained with vermilion red powder, probably cinnabar” (Benavides, 1991: 56, 65). The author notes the above terminology used, as well as a lack of confirmation in the paper as indicating the lack of any rigorous analyses of the red pigment to confirm his identification. This practice of red-stained bones is also described for the Arawak culture of Venezuela, and the Caribs of Guiana (Peabody, 1927: 211). The site consists of a number of chambers in different arrangements, throughout which the human remains were distributed. Regrettably the site suffers from the same problem as many others in Peru: *huaqueros* (tomb-robbers), resulting in the disturbance of the human remains and their contexts. However, the excavators feel confident that the remains were not much removed from their original positions (Benavides, 1991: 65). Cheqo Wasi is hypothesised to have served as a ‘cult of the dead’ in the funerary rich landscape within which it was situated, connecting with the temple of Vegachayoq Moqo, where worship of the gods was performed (Benavides, 1991: 68; Benavides, 1979).

Applying the same ideas of status burial within a sacred centre, these bones may possibly have been the bones of ancestors, exhumed and painted in ritual ceremonies, or perhaps excarnated (defleshed) and painted before being interred.

A tomb involving the application of cinnabar as funerary body paint in an elite context was discovered at the site of Huaca Cao in the El Brujo Complex, northern Peru. It is extraordinary in the fact that it houses what appears to have been an extremely influential female individual. The site dates to Moche Phase III and was discovered by Regulo Franco in 2006 (Cesareo *et al.*, 2014), providing evidence that women also held elite positions as well as men. The tomb containing the elaborately dressed and tattooed female was located at the top of the *huaca*, indicative of the highest rank (Vogel, 2003). Moreover the tomb was dusted with the addition of a layer of cinnabar, demonstrating that female elite outside the context of a male burial were also anointed with red materials.

Pre-Columbian language – recorded ethnohistorically – provides an interesting insight into the uses of cinnabar and its use as body paint in life and death. Ethnohistorical sources give a view into archaeologically invisible practices. According to early sources (Morúa. 1946 [1590]: 306), cinnabar was known as *llimpi* in Quechua, and the Quechua dictionary compiled by Diego Gonzales Holguín, features the word *llimpicuni* which meant “to paint one’s face and daub oneself with vermilion” (“*Pintarse con bermellon la cara y embijarse*”) (Holguín *et al.*, 1989

[1608]: 213). A rough translation by the author of a passage on the subject from de Acosta's *Historia natural y morale de las Indias* further corroborates this description:

“The Inca Kings of Peru and aboriginal Indians laboured for a long time in the quicksilver mines without realising that it was quicksilver, or anything else but vermillion which they call llimpi. This is used much to the same effect as described by Pliny of the Romans and Ethiopians, which is to paint or dye their faces, bodies and idols. The Indians used it often, especially for war and also during celebrations”

(de Acosta 1962 [1590]: 222-223).

The use of the pigment for body paint is reinforced by records made by Father Martín de Murúa (1946 [1590]: 306) who described its use in application to most of the body in Inca religious rituals. While the use of red as a body paint in life is something that is archaeologically invisible, it is likely that the pigment was used as body paint for the living in rituals. We can infer this from the archaeological evidence of the application of cinnabar to the dead, combined with multiple ethnohistorical references like the above. Cinnabar is used in application directly to the skin of the deceased or to bones after exposure of the body until skeletonisation or when remains have been moved from a primary to secondary resting place. In addition to this, the red mineral was also applied to burial masks or false heads, indicating that the mask acted in lieu of the face of the deceased but that the pigment carried out the same meaning.

2.3 Realgar/Arsenic Sulphide

~ *Raj al ghar* "Powder of the Mine" ~ (Arabic)



Figure 13: Realgar and orpiment in unprocessed form (Schimrich, 2010)

Realgar (As_4S_4) is yet another mineral with sources in South America, occurring in a similar low-temperature hydrothermal vent conditions as cinnabar (Anthony *et al.* 2015) by virtue of the volcanic and hot spring activity of the region. The ruby-red colour of the mineral is considered here to mark it as a potential pigment used by the pre-Columbian cultures (Fig. 13). There appears to be no reason for the ancients to have disregarded a mineral with the same bright red colour and toxic qualities as cinnabar, occurring in similar geological contexts.

Why then does there appear to be an absence of evidence for the use of realgar applied to human remains and other objects in pre-Columbian ritual contexts? A reference to the presence of realgar as a pigment is made by Petersen in discussion of the major ceremonial centres Pachacamac and Sacsayhuaman, near Lima (2010: 16-21). Assuming the pigment was tested, this vague mention is one of the few of realgar use in the record.

Several possibilities may explain this, perhaps sources were not discovered by the pre-Columbians, or perhaps there was a lack of necessity for realgar with the demand already fulfilled by cinnabar and red ochre. Perhaps the fragility of the mineral when over-exposed to light for too long made it undesirable, or means that it no longer exists in the archaeological record. The conversion of realgar to

powdery yellow pararealgar upon long exposure to light is scientifically proven, and it is a possibility that this failure to last may have been seen by the pre-Columbians as unsatisfactory for ritual, and even just aesthetic purposes.

Despite the existence of these possibilities, this thesis argues that pre-Columbian cultures absolutely did use realgar, which will be demonstrated in the following chapter on scientific analyses.

Several realgar mine sites are mentioned by Petersen (2010: 11), but further information about these places is elusive. Modern occurrence of realgar is documented at the gold and silver mines of Choquelimpie (Gröpper *et al.*, 1991: 1215), in Chile fairly close to the modern day Peruvian and Bolivian borders, exploitation of which began in 1988.

The Palomo mine in the Huancavelica Department has also been reported to contain realgar from fairly recent investigations into the presence of anorpiment in the mine (Kampf *et al.*, 2011: 2858; Hyršl, 2008). It is noteworthy that this mine is in the Huancavelica region where the cinnabar mines are recorded.

However, these are modern mines opened in recent history, and do not confirm the presence of mines in these precise locations in pre-Columbian periods. These examples simply confirm the presence of realgar that would be expected in these geological conditions regardless. The mines at Palomo do occur in the same area as the ancient cinnabar mines, however ethnohistorical reference to the mining of realgar from the site does not exist despite this likelihood of its occurrence.

What remains to be seen is the extent to which sources might have been exploited, and whether realgar occurred in large enough quantities for it to be worth mining on a large scale. As with cinnabar, this will mainly be down to identifying its presence in the archaeological record, through more thorough testing of red pigmented finds. We cannot be certain that cinnabar was mined and used more than realgar due to this identification deficit, as many 'cinnabar' pigmented samples may be misidentified.

Like the descriptions of the use of cinnabar through the language referring to it, there is a certain amount of information to be gained from ethnohistorical language references in regards to realgar.

Quechua names for realgar such as *hambi* (de Santo Tomás, 1994 [1560]) *anuy* or *huañuccichuc* (Holguin 1608) and *wañu* (Petersen, 2010: 11) suggest pre-Columbian knowledge of the poisonous nature of the mineral. What is intriguing is whether this knowledge extends back to the pre-Inca phases, and whether it had an

impact on the choice to use it, for example for the preservative effects of the toxicity.

Arsenic has been employed in the art of taxidermy since the eighteenth century, with more than one taxidermy handbook cataloguing recipes including realgar and orpiment, until the invention of arsenical soap by Jean-Baptiste Bécœur (Marte *et al.*, 2006: 144). This indicates the viability of its use for its preservative effects in pre-Columbian Peru, as well as the potential use of cinnabar for the same purpose. More research needs to be done in order to discover what combination of substances was used for the preservation of remains in pre-Columbian Peru, and if red pigments factored in this mixture.

A study carried out by the Analytical Research Laboratory of the Canadian Conservation Institute used radioisotope excited x-ray energy spectrometry (REXES) to examine a large selection of natural history specimens in a non-destructive manner (Sirois, 2001: 65). The identification of mercury and arsenic shows how it is important to bear in mind the clear preservative use of these materials as practiced in more modern times, as it corroborates the idea of realgar and cinnabar being used by the ancients as a preservative of the dead.

Studies by Arriaza *et al* have brought attention to the presence of the harmful levels of arsenic in the drinking water of the Arica region, as early as the Chinchorro culture, which is still problematic for the present day populations of the region (Arriaza *et al.*, 2010). This does not definitely indicate presence of realgar, but it is likely that it would be existent in the area with other forms of arsenic in the earth.

Although *Spondylus* was not used perhaps as a pigment, the red shell was extremely popular for use in mortuary ritual. It served to provide economical advantage to those with control over its exchange, similar to highly valued pigments such as cinnabar and realgar. It also built up the link between red materials and the sea, and the supernatural aspects of the sea such as its role as a conduit to the afterlife. The presence of *Spondylus* lends weight to the use of the colour red as a spiritual and status symbol.

2.4 Spondylus shell

"Mullu" (Quechua)

~ "Bring me some thorny oyster shells!" [Maya Uisa to Tupac Inca Yupanqui] ~
(Solomon and Urioste, 1991: 116)

Spondylus inclusion in some form is something generally unsurprising in ritual contexts in Peru, especially in elite burial contexts. The most commonly found species of the bivalve in these contexts are *Spondylus princeps* and *Spondylus calcifer*. *Calcifer* commonly exhibits a coloured inner rim ranging from purple to orange, whereas *princeps* tends to display an orange to red colour over the entire outer shell and inner rim. Long protrusions are characteristic of the *princeps* outer shell, which has earned it the name 'spiny oyster' (Bauer, 2007: 34-35) (Fig. 14). The outer shell of *princeps* tends to be brighter than *calcifer*, as the latter attracts intrusive epibionts (organisms attaching to the outer surface of the shell which aids in camouflage). The mineral exoskeleton of *princeps* prevents such intrusive invasion and protects the red colour of the shell (Carter, 2011: 64). It is notable that a common epibiont for both species is sponge (*ibid*), the importance of which will be returned to in the results and discussion section of this thesis.



Figure 14: Whole *Spondulus* shell, Museo Larco, Lima [Author's photograph]

From the author's research and personal observation of finds in museums in Peru, the *princeps* shell is much the more frequently occurring of the two. In this thesis, in the cases where the species is not specified the author will be referring to

princeps. The main factors to consider in regards to the presence of *Spondylus* in Peru, is its origin. Both species have been said to originate off the Ecuadorian coast, around the Santa Elena Peninsula. It has been discussed that the great lengths it took to acquire the shell heightened its status as an elite commodity (Paulsen, 1974: 597; Marcos, 1977). *Spondylus princeps* has been described as inhabiting depths of between 6 and 18m (*ibid*) stretching by other accounts to 25 to 60m (Marcos, 1977), not clustering in large numbers. This has since been challenged by Carter (2011), who cites recent investigations which have suggested that *Spondylus* was perhaps not as hard to source as is believed. Carter suggests that *princeps* did not necessarily inhabit such deep waters, and that their territory actually may have even stretched to the northern Peruvian coastline (Carter, 2011: 66-67). There has been little to contest this point of view thus far, however Carter himself admits that the evidence he provides is sparse (*ibid*).

Even if Carter's theory should be proven accurate, sites in the south of Peru would still have needed to source the shell through exchange. The quantities of the shell in the record combined with the evidence for export from Ecuador lends weight to the idea that even if the bivalve did inhabit waters further south, there was still considerable export from Ecuador. Moreover, even if the shells did not live in such depths it is probable that specialised knowledge was necessary to recognise the camouflaged shells underwater, and remove them from their attachments (Bauer, 2007). Although the added difficulty of gathering the shells if they were at a greater depth might add to the elite value, the resources to attain the shell from a distance is believed here to be enough to be indicative of high status. Further research is necessary on this topic, combining an examination of the ancient habitation of the shell and what we can extrapolate from the modern ocean. The idea proposed by Carter regarding the more southern habitat of the bivalve could potentially be supported by the fluctuations of El Niño (Rollins *et al.*, 1986: 3).

Due to the space limitations of this thesis it is not possible to go into detail on all sites evidencing *Spondylus*, of which there are many. However, several key sites will be used to demonstrate the use of *Spondylus* in elite contexts. See Blower (1996) for an extensive insight into the timescale of *Spondylus* finds in pre-Columbian Peru.

Spondylus use is evidenced as early as the Preceramic, at sites such as Aspero and La Paloma (Blower, 1996: 95-96; Quilter, 1989: 24). More substantial contextual

base is available at Caral (ca. 2900-2000 BC) a site displaying monumental architecture suggestive of a ceremonial or administrative role as well as a *Spondylus* workshop (Solis *et al.*, 2001: 724).

The value the Chavín ascribed *Spondylus* is best demonstrated by shell iconography found at the ceremonial centre of Chavín de Huantar. The famous Tello Obelisk dating to the Urabarriu phase (c. 1000-500 BC) (Fig. 15) portrays both the *Spondylus* and *Strombus* (Lathrap, 1973: 96) and an early version of the 'Smiling God' (Rowe, 1967: 84; Blower, 1996:29). The occurrence of both shells with the 'Smiling God' is repeated later in the Jannabarriu phase (c. 400-200 BC) on a bas-relief sculpture from the New Temple (Paulsen, 1974: 601; Rick, 2004: 85). This close association of *Spondylus* with the gods imbues the shell with prestige value that connects the user to the supernatural powers.

Further representations of *Spondylus* were found along with depictions of fish on the ceiling slabs of the Chamber of Ornamental Beams (Carter, 2011: 71). This emphasises the relationship between *Spondylus* and its habitat – the Pacific – with its great symbolic importance to pre-Columbian society especially in relation to the afterlife.

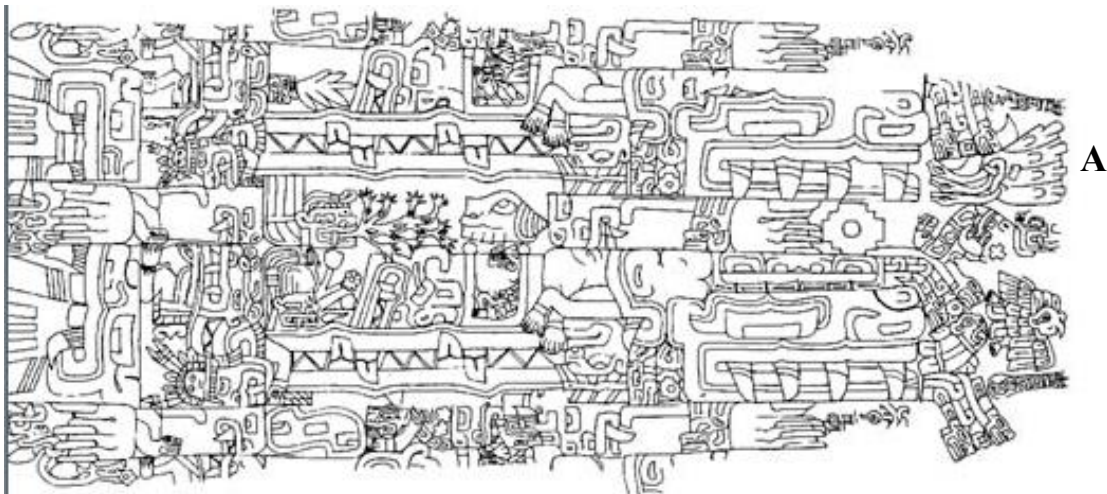


Figure 15: Drawing of the Tello Obelisk, Chavin de Huantar (Miller, 2006)

[Note the *Spondylus* depicted at A]

The Moche and Nasca inherited the use of *Spondylus* from the Cupisnique and Chavín and thereafter it proliferated, appearing in abundance at sites throughout the Moche phase. Shell production is evidenced by the discovery of workshops, where the coloured shell rims have often been removed from the shell, for instance at the site of Pampa Grande (Shimada, 1994: 216). *Spondylus* is prevalent in ritual

deposition, interments of elite status individuals and also as an object of offering (see: Alva and Donnan, 1993; Benson and Cook, 2013; Blower, 1996; Carter, 2011). Accounts of the Royal Tombs of Sipán describe the presence of *Spondylus* alongside the use of red pigment in all three tombs, including inside the textiles wrapping the deceased (Alva and Donnan, 1993: 115, 154).

Following Moche V in the Lambayeque region *Spondylus* use had reached an exceptional level of abundance (Cordy-Collins, 2001a). Wari centres such as Cerro Amaru reveal evidence for *Spondylus* in what appears to be a ritual offering context, where the shell had been burned on the floor of the mausoleum (Topic, 1991: 159). Cerro Amaru has been described as a water shrine with connections to the Wari elite (Topic and Topic, 1992: 174; Glowacki and Malpass, 2003: 438).

Further indication of the status and political power indicated by the shell is demonstrated in its employment by the Sicán culture, scattered before the highest elite or fed to the deceased as ground shell dust (Pillsbury, 1996: 317).

Chan Chan was undoubtedly an elite ceremonial centre, comprising monumental architecture and the great tombs of Chimú rulers. *Spondylus* shells were found both unbroken and worked around the site, especially on the burial platforms (Keatinge and Day, 1973). This appears in correlation to architectural representations, for instance the “Los Buceadores” relief sculpture which has been interpreted as illustrating the use of a diving weight to collect *Spondylus* shells (Pillsbury, 1996). Such weights have been identified in the Priestess’ tombs from San Jose de Moro as part of their trappings alongside whole *Spondylus* shell (Cordy-Collins, 2001b: 40).

Chan Chan was also reputedly a major acquisition and distribution centre for *Spondylus*. Evidence for the corralling of llamas for exchange caravanserais at Chan Chan is reflected in the Lower Canete Valley at Cerro Azul, showing a number of exchange processes of marine goods (Topic 1990: 161, 164). It is advocated that the exchange network of the Chimú was fundamental to the expansion of the ‘ritual and economic basis of power’ (Pillsbury, 1996: 313), with *Spondylus* playing a key role.

Contrary to some belief, it has been argued that the peak in *Spondylus* use was not during the Inca period, but during the Moche and Sicán, due possibly to the proximity of the north Peruvian waters that may have been inhabited by the shell (Carter, 2011: 64).

A study conducted by Jackson (2004) at Huaca el Dragon and Huaca Tacaynamo, Chan Chan, examined an example of the application of pigment to ritual objects. Wooden figures found at the sites dating to the Early/Middle Chimú period, appeared to make up a ritual scene (Jackson, 2004: 301). Three figures exhibit what appear to be stab wounds, painted in a 'tulip shaped motif' (Fig. 16) in addition to cinnabar (Jackson, 2004: 311). Jackson postulated the tulip shapes to be representative of *Spondylus* (Pillsbury, 1996). The *huacas* at Chan Chan included burial platforms that housed the remains of the Chimú elite ancestors.



Figure 16: Figurine displaying red 'tulip' *Spondylus* motif, Chan Chan (Jackson, 2004: Fig. 9b)

The multitude of evidence for the collection, exchange and manufacture of the *Spondylus* shell feeds the debate over the role of the shell in iconography, and how it was used in the socio-political sphere.

2.5 Conclusions

This chapter has investigated several possible sources of red material based on what has been found in the literature and through a consideration of the geographical nature of Peru. The strong evidence for the use of *Spondylus* is apparent, and its many symbolic attributes as well as the effort that went into its acquisition as discussed above make it clear why it was favoured as an elite good. The use of pigments however, is somewhat more ambiguous. Although there are numerous cases in archaeological reports where cinnabar or red ochre has been 'identified' this thesis would argue that in many of these cases the pigment might have been misidentified. The following chapter seeks to show that due to the range of possible pigments in the natural environment accessible to pre-Columbian societies, it is extremely necessary to carry out thorough scientific analyses.

Chapter 3: Materials

In order to show the necessity of detailed scientific analyses of red pigments as well as adding weight to the theory that red pigment was used by the elite, this chapter will include a number of scientific analyses. This chapter hopes to reveal the variety that may be present in red pigmentation applied to the remains of individuals and objects. To examine what pigments specifically were used, this thesis has sourced several samples from a number of museums. The details for the acquisition of these samples follow.

3.1 Sourcing and sampling methodology

The author sourced samples from two museums in Peru – The NMAAH and Huaca Pucllana. Prior to travelling to Peru, correspondence with the aforementioned museums led to approval for samples to be taken from both museums. The author was also put in contact with Dr Lauren Cadwallader through a university acquaintance. Cadwallader noted the presence of red pigment on the remains of individuals she has examined as part of her PhD (Cadwallader *et al.* 2014: 9). Cadwallader offered to provide two remaining red-pigmented samples, each from two individuals discovered in her Ica Valley PhD excavations. These were samples taken from the individuals by Cadwallader using the same sampling procedures as described in the Huaca Pucllana description below. Personal communication with Dr Cadwallader revealed that there had also been red pigmented hair, however due to washing of the hair for a different analyses, the identity of the pigment had been lost.

The samples provided by the NMAAH were taken by a researcher working at the museum and provided to the author. Red-pigmented individuals were selected and the sampling procedures as per the section as follows were used.

The research team at Huaca Pucllana led by Isabel Flores were happy to allow the author to personally take the samples under supervision. Pigment was extremely obvious on the remains, painted onto objects, and in unworked and worked pure forms. Wearing gloves and a facemask to avoid contaminating the samples, care was taken to use sterilised equipment. Fresh sterilised equipment was used for

each sample to avoid cross-contamination. Each sample was sealed in its own plastic bag labelled with the sample number assigned in this thesis, and the context number from the site.

As little as possible was taken from each individual or object, as the methods used to remove and analyse the material were destructive. Care was also taken to remove samples from less obvious places, for instance from under the chin of the false head, and collected from fragments already fallen from the heads of the individuals.

The information included in section 3.34 of this chapter on the sites stem from discussion with the research teams. Contextual information was supplied in discussion with the research team, and further information was sourced from previous publications by researchers on the site (Cadwallader *et al.* 2014: 9). It has been suggested that the further information soon to be released into the public domain in upcoming publication by the team will also have a bearing on this topic. Understandably this could not yet be included, however will be useful for future studies.

From these methods of research it is possible to confirm the ceremonial and elite nature of the site during its occupation by least two cultures: the Lima and the Wari. Furthermore, there was also evidence for the processing of ores into red pigment, which were possibly those used in application to the human remains and objects at the site – to be verified through the scientific analyses presented in this thesis (Isabel Flores, Jose Ccencho, pers. comm.).

Dr Stephen Buckley and Prof. Jo Fletcher personally sourced the samples from mummies in Turin's Museum of Human Anatomy collection prior to the commencement of this thesis project. During our initial discussion of the thesis, Dr Buckley and Prof. Fletcher noted that the remains in question evidenced red coloration. These samples were offered for inclusion in the scientific analyses for this thesis, with the view to expanding upon the project following completion of the thesis. Dr Buckley and Prof. Fletcher followed the correct sampling strategy, with the aim of creating minimal damage and preventing contamination of the samples. The Warrington Museum supplied samples from a skull and false head, which they received from William Smithies with minimal contextual information.

The scientific analyses were carried out in the personal laboratory of Dr Buckley in Scarborough. As the author is not an archaeological chemist, Dr Buckley offered to

carry out an induction and guide the author through the process of sample analysis. Under instruction, the author was able to prepare the samples for analysis.

3.2 Contextual information of samples

3.2.2 Cambridge University

Dr Lauren Cadwallader, of the McDonald Institute for Archaeological Research at the University of Cambridge, provided two of the samples for these analyses. These were both skin samples, originating from the scalp region of two individuals, and both evidencing red pigment.

The samples originated from the Cemetery 1003 site in the Ica Valley's Samaca Basin, with a Late Intermediate settlement site (H9) located close by and sharing the same material culture (Cadwallader *et al.* 2014; 15). Unfortunately heavy looting in the area had disturbed many of the contexts. However, the study by Cadwallader *et al.* seeks to show that through the use of radiocarbon dating the contexts are still dateable, confirming the dates drawn from artefactual evidence. Based on this method of dating, most of the context dates from the Late Intermediate to the Late Horizon. The study also describes the identifying features of an elite burial context, and notes how the site evidenced several of these, including the presence of elite structured tombs at the site (*ibid*). The red painting of bones is cited as a specifically elite practice, lending weight to the cases of this being for the purpose of elite use as described in Chapter 2.2. *Spondylus* fragments were also reported in the finds from the site.

Within this context Cadwallader describes a number of individuals, 28, 36, 39, 47 and 79, the remains of which evidence red pigment staining (Cadwallader *et al.* 2014: 9) (Appendix B Figs. 1-4). The samples provided for the study presented here were taken from individuals 36 and 39 from the 1003 site (Appendix B Figures 1 and 2). Several patches of red pigment on the samples were described by Cadwallader *et al.* as "very bright" (Cadwallader. 2014: personal comm.) were present on the skin (2014: Appendix 1), which was confirmed upon visual examination of the sample when it was received for this project.

3.33 Museo Nacional de Antropología, Arqueología y Historia (MNAAH)

Each sample from the MNAAH is a small amount of red-pigmented skin taken from four mummified individuals dating to the Paracas culture (500 BC – 100 AD) from the Ica region of Peru.

The samples originate from an area not far from the Cambridge samples, within a similar time frame. The samples are taken from four mummy bundles excavated by Julio C. Tello and colleagues from Wari Kayan Necropolis, in the Ica region. As one of the largest cemeteries of the Paracas, there were a great number of both human remains and burial goods excavated in 1927 and 1928. During the excavations a total of 429 mummy bundles were found. The samples analysed here originate from four of these opened bundles, all of which were female individuals (Personal comm. with MNAAH) (Appendix B Figs. 5-7).

A recent project, the Paracas Archaeology Research Database, part of the project 'Practice in Life, Presence after Death: Style and Substance at the Paracas Necropolis' has conducted the first large-scale investigation of the discoveries of Tello, which up until recently were extremely difficult to gain access to. This project has lately created an online database where it documents its findings, providing an extensive record of each context with open access to the public (Peters. 2014).

The grave goods excavated from the Wari Kayan Necropolis tombs are of a nature indicative of prestige, and have been identified as symbols of elite by several researchers (Peters, 2012: 1). Aside from burial with the ornate iconographic textiles for which the Paracas have become infamous, there are also a large number of personal ornaments such as metal jewellery, feather fans, wigs and importantly shells worked into various amulets and jewellery.

Although the compilation of this information is excellent, the ongoing issue lies in the way that red pigments are documented. There are many references in these archives of 'paint' or 'powder' with no description, firstly of the colour, and secondly an identification of the mineral components. From this site alone, multiple cases of red pigment may have gone unidentified.

3.34 Huaca Pucllana (HP)

"Cada remodelación del edificio es precedida por diversos rituales de sacrificios humanos, banquetes, elaboración de hoyos y rompimiento de vasijas" (Vargas Nalvarte, 2014: 303)

"Each remodelling of the building is preceded by diverse rituals including human sacrifices, banquets, the making of holes [pits or graves] and the breaking of vessels" (Author's translation).

The Huaca Pucllana samples are more varied in nature, comprising of samples sourced from different areas of the site and from a number of materials. The site of Huaca Pucllana was initially a major ceremonial centre of the Lima culture, acting to reinforce power structures of the elite in the area, especially when it came to control over water sources. Following the abandonment of the site at around 700 BC, there was an interval of approximately a century before the Wari took over the site and created an elite cemetery in the highest areas of the site. It is this phase of occupation to which the samples used here date, using material discovered during the 2008/9 excavations.

The two red painted female skulls come from funerary contexts within the high levels of the adobe pyramid structure, in tombs including objects indicative of elite status (Appendix B Figs. 9 and 10).

The two wooden false heads were discovered in a tomb associated with five female mummy bundles. Although it is impossible to know which of the bundles the heads were associated with, this does not decrease the value of the red pigment use. One of these false heads was entirely covered with red paint, aside from the eyes; the second mask is more faded yet still evidences the same red paint. It is from the first mask that the sample is taken (Appendix B Figs. 11 and 12).

Stored within what appears to be a box made of reeds similar to totora, were found a total of fifty-five camelid skin pouches (Figs. 17 and 18 below). To limit destruction the curators of the site have only opened two of the bags, both of which contained a powdered red pigment, and it is supposed that the other bags are likely to mirror this. Also in close relation to the box but not within it were red stones that it is believed by the site curators to be related to the powder (Appendix B Fig. 12).

In the analyses conducted in this study, it is hoped that the relationship between the stone from outside the reed box and the pigment in the pouches might be made clear, with the possibility that they may be the same material (Dr Isabel Flores Espinoza and Jose Ccencho, Huaca Pucllana. 2014: personal comm.).



Figure 17: Reed box containing camelid skin pouches: CFA20-01 (986), CFA20-01 (833) [Author's photograph]



Figure 18: Camelid skin pouch containing red pigment: CFA20-01 (1030) [Author's photograph]

3.35 Warrington Museum

The samples from the Warrington Museum come from the collection donated to the museum by William T. Smithies in 1898 as part of a collection of more than 275 artefacts from ancient graves in Peru (Craig Sherwood. 2014: personal comm.). The first sample is taken from the chin of a red-painted skull, the second from a red-painted false head (Appendix B Figs. 14 and 15). Unfortunately, as Smithies likely acquired the artefacts through *huaqueros*, the provenance of the heads is uncertain. However it is noted that they were from the Rimac Valley region, somewhere between the sites of Vitarte and Chosica.

Chapter 4: Methodology

4.1 Preparation of the samples

In order to ensure that the value of the samples was not restricted to only inorganic tests, the samples were prepared so that the organic components of the samples were extracted, leaving behind the inorganic residue to be analysed using a 'spot-test' method. This way the destructive techniques would not prevent later analyses of the organic components of the samples, which could contain important information.

These analyses were carried out in the personal lab of Dr Stephen Buckley and Professor Joann Fletcher. The analyses of these samples was led by Dr Buckley, and in the initial processing of the samples, he provided detailed training in the correct analytical procedures.

Individual test tubes, vials and pipettes for every individual sample were numbered and cleaned using the solvent dichloromethane. To calculate the weight of the samples, the individual test tube weight was deducted from the weight of the test tube containing the sample.

Weighing the samples may have been of limited value as they sometimes were so small that they fell within the error range of the analytical balance ($\pm 0.05\text{mg}$), i.e. $< 0.05\text{mg}$.

The samples were either left as they were in the test tube, or crushed in the test tube using a clean sterilised spatula, which was possible and/or useful with some samples but not others depending on the nature of the sample (see Appendix C table).

The extraction process was initiated with the addition of an appropriate volume (0.1 – 1ml) of a chloroform-methanol solution (2:1 v/v).

Two of the samples (HP 3 and 4c) were so small and powdered, it was necessary to remove them from the plastic sample bags using methanol. The chloroform/methanol solvent was not added to these two samples for the first extraction.

The tubes were placed in an ultrasonic bath for one hour, where the high frequency sound helped dissolve the organic material in the solvent.

After ten minutes of centrifugation (1000 rpm), a clean, sterilised pipette for each sample was used to remove as much of the supernatant solvent as possible

from each tube and transfer it to individual vials. This extraction was performed three times for each sample. The remaining residue after these extractions was the inorganic material upon which the 'spot tests' could be carried out.

4.2 Inorganic chemical analyses through specific chemical 'spot tests'

Due to the limited funding and sample size it was not possible to use the ideal method of analysis, which would have been inductively coupled plasma mass spectrometry (ICP-MS) as will be discussed later in this chapter. As an alternative to this expensive technique, these inorganic analyses were carried out using specifically chosen well-established specific 'spot tests' (See Appendix E). These tests are traditional and the science is very straightforward: the minerals were either there or they were not.

Each chemical 'spot test' employed was selected based on the ready availability of the reagents needed, and their specificity and sensitivity for the metal and salt components of the likely sources of red minerals they were composed of, informed by the geological and archaeological evidence from Peru. As discussed above, the suspected minerals were: cinnabar (mercuric sulphide, $\text{HgS}/\text{Hg}_2\text{S}_2$), haematites/red ochres (iron oxides, $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$), realgar (arsenic sulphide, As_4S_4) and 'red lead' (lead oxide, Pb_3O_4). In order the tests for these minerals are as follows: mercury, iron, arsenic and lead. The restrictive quantities of the samples meant that only several very specific tests could be used.

Referring back to the archaeological reported findings of red pigments, cinnabar is the mineral most often noted, despite a seeming lack of scientific investigation.

4.3 Practicalities of Implementation

There were a number of factors in this project that had an impact upon the execution of various aims, or restricted the level of quality of certain areas of study.

The largest issue was financing. As this project was unfinanced this meant that there were limitations regarding the methods of inorganic analysis. Where the use of inductively coupled plasma mass spectrometry (ICP-MS) and Raman Spectroscopy would have been preferable, it would have been financially unfeasible. For this reason, it was decided that the spot test method would be used. Although this method may be less sophisticated than ICP-MS and Raman

Spectroscopy, it has been carefully developed by Dr Stephen Buckley and is known to be effective, if not as detailed as ICP-MS in particular.

The second obstacle was that of the author's scientific knowledge with regards to the scientific analyses. As noted in the previous section Dr Stephen Buckley instructed the author and conducted the analyses with the involvement of the author in the preparation of the samples.

Chapter 5: Discussion of Results

The inorganic spot-tests reveal the unequivocal presence of the red minerals discussed in Chapter 2. This shows the remarkable range of different pigments used, identified in a very small set of samples from different areas of Peru. This shows us how important it is to carry out inorganic tests, even if they are only 'spot tests' as opposed to the more expensive ICP-MS. This is so that generalisation and misidentification in archaeological reports can be avoided and it will be possible to have a more accurate representation of the red materials in use by pre-Columbian cultures.

The red materials signify the status of the elite through the sourcing of the pigment as well as the symbolic connotations of blood, life and rebirth, which relate to the supernatural and provide political control through ritual acts or displays of power.

The purpose of the inorganic analyses was to investigate the minerals used in the preparation of confirmed elite individuals represented by the samples from Huaca Pucllana, MNAAH and Cambridge. The analyses revealed clear evidence for the wide range of red materials that might be used in high status contexts.

The second purpose was to demonstrate the importance of the analysis of pigmented samples to gain an insight into the variety of materials used. This opens the door to a discussion about why certain minerals were used when there may have been others more easily accessible, and the systems that governed their processing and transportation.

The results from the Huaca Pucllana samples reveal that the material found at the site was cinnabar in different states: solid, ground and as a component of the body paint mixture. This suggests that the pigment was being ground at the sacred ceremonial site, for use in funerary and possibly other ritual practices. The inclusion of cinnabar in the Huaca Pucllana burial contexts is indicative of the co-joined sacred and status value of the pigment.

The origins of each of the samples are fairly closely located, between Lima and Ica. The samples from Huaca Pucllana, Lima, are cinnabar based, those from the MNAAH (Paracas) and Cambridge (Ica) are realgar based and the Warrington samples from the Rimac Valley slightly north of the above contain both minerals. There is the possibility that the sources used for the minerals in the Huaca

Pucllana, MNAAH and Cambridge samples lay close enough for those processing the Warrington heads to access them both.

The understanding of what specific pigments were used in ancient preparation of the dead can extend our knowledge of processes and significant acts at the sites in question. By analysing samples from human remains or painted objects, we can find out what pigments were being used.

Chapter 6: A Consideration of the Social Implications

The implications of the inorganic tests in combination with an extensive analysis of the available literature indicate two main areas of significance. The ritual aspects of society, impacted by supernatural events and in turn influencing social regard of the elite is discussed below in 6.1. The focus upon long-distance exchange of red materials to be used in elite contexts and in elite controlled public rituals is informed by the discussion of the materials themselves. This will be investigated in the following section 6.2.

6.1 Impact of the 'supernatural' on the significance of red material

Previously discussed symbolisms attached to red materials relate closely to supernatural forces. Pre-Columbian Peru would have been at the mercy of a number of natural disasters that would have necessitated supplication of the gods. However, due to the space limitations of this thesis, the focus here is mainly upon the sea, with its power as an afterlife conduit. Moreover the destructive powers of the sea during ENSO as well as the effects of 'red tides', lends supernatural power to materials such as *Spondylus*.

The pre-Ceramic Chinchorro culture were a coastal population suggested to have been influenced in the use of red materials by these supernatural events.

An argument put forward by Standen (1997) was that the artificial and naturally mummified individuals were contemporaneous. Standen suggested that the "use of techniques in some of the bodies that make a specific set...very similar to each other, would appear to demonstrate strong ties of social identity and probably biological kinship relations – which is perpetuated beyond death" (Standen, 1997: 155) [translation by author].

It is this theory that is supported here: that this burial of differentially treated individuals, contemporaneous with non-mummified individuals, indicates an elite group (the artificially mummified) and the remains of non-elite (naturally mummified).

Bernardo Arriaza collaborated with a number of colleagues in a project to correctly radiocarbon date a number of remains from several Chinchorro burial sites (Arriaza *et al.*, 2005b). The results from this investigation reveal that the Black, Red and Mud-Coated styles of mummification employed by the Chinchorro

developed in an evolutionary manner. However it also reveals a number of naturally mummified individuals dotted throughout these styles. The conclusion of these dating analyses indicates the possibility of differential treatment of some deceased members of the society (Arriaza *et al.*, 2005b: 670), potentially an elite kin group of some nature. It appears that the presence of such evident efforts of preservation of the deceased indicates a strong religious element in the culture. The intention of preservation, in this case the artificial mummification of the dead, indicates a belief in an afterlife and implies the ability of the dead to continue to perform a function in the daily life of the society.

A possibility presented here is that the black and red styles are specific to elite kin groups, the status of which was reinforced by the artificial mummies being kept above ground, as indicated by evidence for repair on the mummies (Arriaza, 1995b: 152). The important factor in this thesis is the shift to the red style, and the way that red pigment was used in the preparation of the dead.

The artificial mummification of Chinchorro dead also implies a belief in an afterlife in which the body is needed 'intact' and that the dead continued to perform a function in the daily life of the society. The elite group could ground its status through ancestry, with the evidence for the inheritance of power in the ritually preserved ancestors.

In order to pursue this theory, DNA analyses would be a high priority to confirm whether or not the modified individuals share a genetic connection. It must also be considered that the sample of modified individuals that have been found so far may not be fully representative of Chinchorro mortuary tradition. Issues of both preservation and extent of excavation weaken the reliability of discussions on this topic.



Figure 19: Chinchorro red mummified infant (Ferorelli, 2012)

It would be justified to suppose that it was largely the environment that dictated the cultural practices of the Chinchorro. Situated in an area not only prone to tectonic activity but also at the mercy of the El Niño and La Niña phenomena on the coast with a dependence upon maritime economy, the environment exerted tremendous influence over the lives of the Chinchorro. That the Chinchorro were a maritime economy is evident from archaeological and scientific analyses that have been carried out in investigations into the culture. As well as a diet that was comprised of 75% seafood, osteological evidence of auditory exotoses has also been found, indicative of large quantities of time spent underwater (Aufderheide, 1993: 199) as noted in later Peruvian coastal populations (Jones, 2010: 100). Furthermore, high quantities of maritime artefacts have been uncovered at Chinchorro sites.

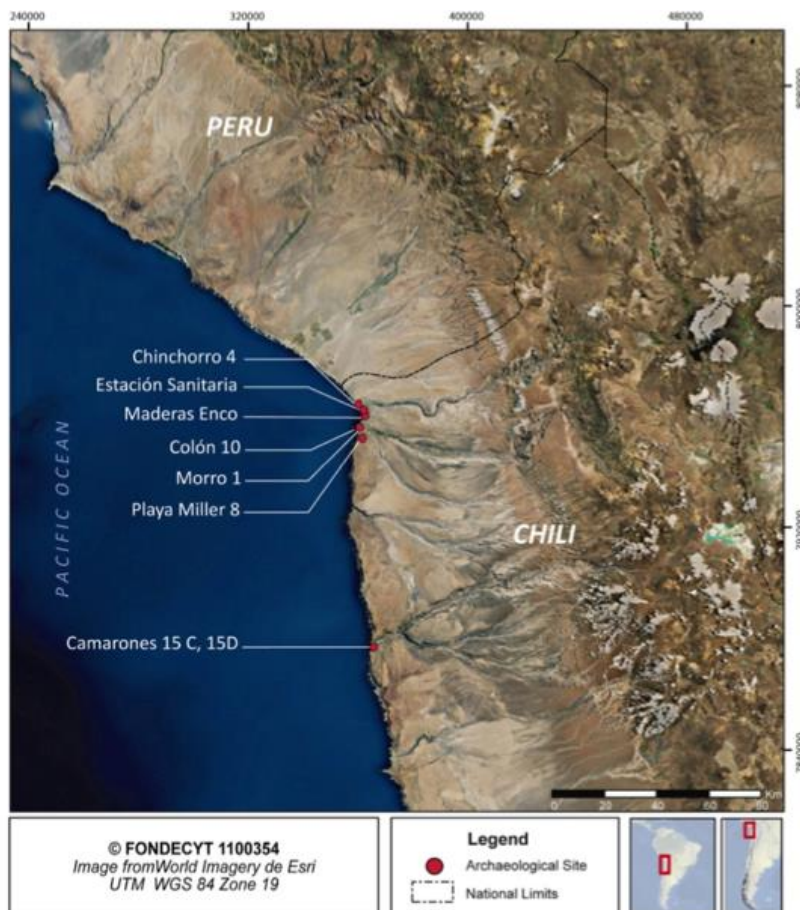


Figure 20: Map to show Chinchorro sites (Sepulveda *et al.* 2014: Fig. 1)

The appearance of El Niño at approximately 5,000BC (Rollins *et al.*, 1986: 3) would also have caused increased rainfall and runoff from the arsenic rich highlands, possibly heightening the concentration in the water reaching the Chinchorro.

Sandweiss *et al* describe how knowledge of how ENSO events affected resources are crucial to understanding cultural changes (1996: 1531).

Crucial to the line of argument regarding the impact of ENSO are studies conducted by Rollins *et al* (1986). In this and later work, the origin of the El Niño phenomenon has been investigated, with results that suggest a correlation with the Chinchorro practices. Through examining variations in warm- and cold-water molluscs at the sites Pampa de las Salinas and Salinas de Chao, just south of present day Trujillo, Rollins *et al* were able to make estimates about the changes in the sea temperatures. They propose that the convergence point of the warm Panamic Province waters and the cold Peruvian Province was 500km further south between around 11,000 to 5,000 BP (Rollins *et al.*, 1986). Dating focused mainly on molluscs, but incorporating beach ridges, glacial and phosphorus deposits, and diatom and fish scale distribution indicates the change at approximately 5,000 BC. Rollins *et al.* extrapolate that this is evidence indicating the first El Niño episode on the Peruvian coast (Rollins *et al.*, 1986: 14; Sandweiss *et al.*, 1996: 1531). They state that: “Reorganisation of the east Pacific current system and the birth of El Niño may have occurred in an interval of only 500 years” (1986: 11), fitting the time frame for the theorised emergence of the Chinchorro.

Despite there being no direct evidence for the worship of deities at this point in time, it is reasonable to postulate that the society would have regarded the environmental changes as a supernatural event. Arriaza argues that “ideological innovations manifested in mortuary practices and mummification styles... [represent] ... local shifts in their spiritual beliefs” (Arriaza, 1995: 51). It is argued here that those ideological shifts were brought about first by environmental catastrophe, and secondly by a change in leadership.

These environmental factors are by no means limited to the Chinchorro and the Preceramic. The destruction inflicted by the power of ENSO and other natural disasters relating to the tectonic and volcanic nature of the region stretch from the pre-Ceramic to the modern day.

It is this kind of supernatural event that would have lent authority to the elite, as in these times it would have been their responsibility to carry out supplications – such as sacrifice events.

As has been noted at a number of points throughout this thesis, blood used to make these supplications was the ultimate red material connecting the elite to the supernatural.

It is further possible that ENSO may have also connected *Spondylus* to the supernatural and then to the elite in their use of the shell. It is suggested here that *Spondylus* may have inhabited the coast of Peru during ENSO events, perhaps only the north coast as suggested by Carter (2011). In this case the shell may have been associated with the supernatural power of the destructive properties of ENSO, as well as the 'red tides' mentioned in Chapter 1.22, contributing to its status. Algal blooms have been associated with ENSO events, brought with the warmer waters, and in the case of harmful algal bloom, often proving lethal to marine life. A severe ENSO event could bring a massive scale of catastrophe, perhaps including multitudes of dead aquatic life washed up by a red sea.

Spondylus is further linked to the supernatural in direct relation to the gods in the Huarochiri myths, where Parya Qaqa tells a man not to worship a god (Wallullu) that requires the sacrifice of his child. Parya Qaqa then eats the *Spondylus* the man is carrying as an offering, "producing a loud "cap cap" sound". The Manuscript also tells of how in exchange for his help in defeating the Inca's enemies, the god Maca Uisa demands to be brought *Spondylus* shell, which he eats making a "deafening crunching noise" (Solomon and Urioste, 1991: 67-8, 116).

Additionally *Spondylus* is found in iconography as a common trait of Andean female deities in place of genitalia (Lyon, 1978), connecting to the concept of the *vagina dentata* used in other cultures. It is unclear if the concept of the *vagina dentata* is the same in South America as elsewhere, however this association with female deities is clear. It is unknown whether the *Spondylus* gained prestige through association, or was in fact a direct influence upon this iconography. (Blower, 1996: 32). Nevertheless, this connection of *Spondylus* to female reproduction also ties into the symbolism of menstrual blood.

Mentioned above was the idea that the Chinchorro mummies may still have had a function, kept above ground in sight of the living society, evidenced by repair work. Similarly, there is evidence for other cultures keeping the dead as part of the society by ritually feeding them. The record details a number of cases whereby the dead and the gods (the supernatural components) were fed with blood or red material, either orchestrated by or through the elite themselves.

There is evidence to argue that red material was 'fed' to the Wari deceased through holes deliberately created in tomb caps in the Wari period. Evidence for this at the site of Cheqo Wasi, (Benavides, 1991: 56) describes holes in the tops of the chambers, which often connected to canal grooves running into the tombs. The

remains of cinnabar have been found in these channels, correlating with the idea of feeding the dead, or the gods through them (Benavides, 1991: 61). It is also described how ground *Spondylus* shell was also 'fed' to the deceased at this site (Hastorf, 2003: 548; Benavides, 1991: 61). The use of red material to feed the dead perhaps correlates with the use of blood as a high offering to the gods. The red material symbolises blood and thus carries its significance. Retaining links to their deceased ancestors was an important factor in the retention of power for the elite, as their legitimacy was fortified by their elite ancestral connections.

Spondylus has been referred to multiple times as a food of the gods. The potentially hallucinogenic properties of *Spondylus* flesh if affected by seasonal toxicity has been likened to the use of other hallucinogens to enter otherworldly states for spiritual communication with ancestors (Glowaki. 2005: 260-61).

We see here a cycle linking the supernatural and the divine to ritual activities performed throughout the pre-Columbian period: the consumption of *Spondylus* as an example, followed by the extraction and consumption of blood in sacrifice. Of course, the Huarochiri myths in question date only to the Inca phase, however it is likely that these themes originated in much earlier cultures, and were adopted by the Inca upon seizure of power. It is clear that there is much cultural overlap throughout pre-Columbian Peru, as one culture takes over from another. There is still contention over many cultures in reality being the same, due to similar time scales and comparability of culture. Whether this is true or not, many would have been influenced by the preceding or coeval cultures, such as the influence of the Cupisnique on both Moche and Nazca ideology.

6.2 Red Material and Elite Exchange

The exchange of prestigious material culture was one of the most integral factors in the value of red material and the power its procurement and use provided the established or aspiring elite.

In his 2006 article, Vaughn looks at the roles of craft production, exchange and political power in the emergence of societies prior to the domination of the Incan Empire, Tawantinsuyu (the land of four quarters). In relation to the beginning of the exchange of *Spondylus*, his ideas are particularly applicable. This lies in the theory that aspiring elites turned to long distance exchange for the acquisition of

goods. Prestige was inherent in the difficulty it took to source the goods (Vaughn, 2006: 320).

Varying between whole shell, broken shell and crushed shell, as well as ornaments and inlays, *Spondylus* use is prolific (Murúa, 1987 [1590]: 422). *Spondylus* was a relatively non-circulatory good, often ending its trading lifespan in a deposit, tomb or otherwise, with only a small amount of worked shell that might have been exchanged on, leaving aside the *chaquira* beads used as currency in Ecuador. In light of this it is possible to gain an idea of the unprecedented amount of *Spondylus* being exchanged into the areas that were possibly outside the zone of its natural habitat.

The monopoly the elite held over these items is demonstrated in a theory proposed by Burger (1992) in a study of the important ceremonial site of Chavín de Huantar. He suggested that the temple at any sacred site would be able to exchange with other ceremonial centres to gain luxury goods (*ibid*). These centres witnessed the development of skilled artisans, who specialised in crafting these materials. The sourcing and production of these particularly fine goods represented the powerful reach and social standing of the elite as the consumers of the resulting jewellery and objects (D’Altroy and Earle, 1985: 333).

Applying the above ideas of prestige to the long-distance exchange of *Spondylus*, the crucial question is whether it inhabited the coasts of northern Peru as well as Ecuador, or whether the changing environment caused by El Niño might have facilitated annual southward shifts to northern Peru. Moreover, there is the question that even if the latter were true, whether this alone would have provided enough to satisfy the high demand for the shell. If the supply was not large enough exchange with Ecuador would still have been necessary and exchange to the south of Peru would definitely still have occurred.

Due to the ethnohistorical accounts of *Spondylus* exchange it is considered that perhaps there is a middle ground between the theories, with the shell being sourced both from Ecuador and the north of Peru.

As well as attesting to the exchange of the shell, the ethnohistorical accounts also detail the regard in which the shell was held by natives, being “valued more than silver or gold” (Gamboa, 1943 [1572]: 93). Even the colonialists saw the benefit of exchange in the shell, as mentioned by de Arriaga: “even the

Spaniards...make a profit out of selling these shells to the Indians of the sierra” (1968 [1621]: 45).

In support of this theory of maritime exchange of the shell despite Carter’s suggestions, one ethnohistorical account written by Francisco de Xeres relates an encounter with a boat full of valuable goods in 1526 off the Ecuadorian coast, all for exchange with *Spondylus* for the production of *chaquira* beads (de Sámano, 1968 [1527]). A similar account by de Oviedo y Valdes of the “navio de tractantes” details the strings of *Spondylus* beads and the vast amounts of prestige goods exchanged by indigenous people (de Oviedo and de los Rios, 1853).

Proceeding from the peak in *Spondylus* demand, the Chimú period holds valuable references to the shell in architecture, which is much less seen in the Moche. Dated to the early Chimú phase is the ‘Los Buceadores’ relief at the centre of Chan Chan.

The implications of this relief seem to be that there was a working understanding at the site of how the shell was collected, through either second-hand reports (Blower, 1996).

The long-distance exchange invested in by the Chimú, and other great polities served to create and maintain the elite power structure through reinforcement of ritual and economic power (Pillsbury, 1996: 313).

Spondylus was not the only material with exchange function based on colour and difficulty of acquisition; it is evident that red pigment had a very similar utility and value. Red materials as exchange items possess very clear elite roles, considering the economic and political power they signify. Members of the elite gained and retained power and control over society, by reinforcing the validity of their power, which was supported by the production and use of red materials.

Due to the presence of ochre, cinnabar and realgar in analyses of pigments used by ancient Andeans, we can infer that they were mined despite the scarcity of evidence for the mine sites themselves.

Saunders describes how mines were worshipped as *huacas*, and how the most beautiful materials, for instance the crimson cinnabar ores were revered as *mamas*, the mothers of the mine (2004: 127). He also describes how through the manipulation of natural substances such as ochre “cosmological and ritual significance [was] found.... [and] used as symbols of social status and spiritual and ethnic identity” (2004: 123).

Cinnabar appears to have been used mainly in ritual contexts, though there is occasional evidence of its use as a dye in ceramics. A mineral such as ochre is perhaps devalued due to that fact that it occurs in much greater quantities and is more easily accessible than cinnabar and realgar. Furthermore the danger of mining the mercury and arsenic ores, which would have a toxic effect upon the miners, may have increased its value more still and possibly added to its perceived supernatural power.

Unfortunately, other ancient mine sites have been lost to us due to the increase in large-scale mining following the Colonial Period, when cinnabar was in demand for the silver production process. The only unequivocal ancient mine site, dating far back into the pre-Columbian, is the mine of Huancavelica, mentioned previously in the section on cinnabar.



Figure 21: Map showing the location of the mines at Huancavelica and nearby important ceremonial sites (Burger and Mendieta, 2002: Fig. 1)

Due to subsequent mining activity for the extraction of mercury for use in silver processing, the archaeological evidence for mining of the mineral is limited to the resultant pigment in cultural contexts. The main available resource for information on these activities is ethnohistorical. Evidence of previous mining in Huancavelica was apparent when Enrique Garcés first discovered the site in 1559, and he noted how the local people were aware of the mining activities of their forebears. De la Espada (1965: 118) described how the mining was pre-Incan in nature, and Cantos de Andrade documented the impressive scale of the mining with the basic implements of Pre-Incan cinnabar seekers (Ruiz Estrada, 1977: 30).

Mina Primavera, in southern Peru exploited by the Nasca and the Wari successively is the best-known haematite mine. Approximately 700m³ of haematite was removed in two millennia. Production is confirmed by the presence of mining and processing tools, which outline a process of pulverisation and packaging of the ore in order to be transported (Eerkens *et al.*, 2009). Elera describes the grinding to powder of haematite as a ceremonial activity, highlighting the ritual importance of both haematite and cinnabar (Elera, 1993: 250), and so it should be considered that the grinding of the minerals at the mine site might also be imbued with ritual meaning as well for the practical purpose of transportation.

The worship of the mine as a *huaca* is indicated by *Spondylus* offerings in Layer B, and the discovery of musical instruments indicative of rituals (*ibid*: 132), with similar ethnographic examples of worship in existence (Nash, 1972: 223).

It appears that the use of haematite decreased in the Late Intermediate Period, which could be a result of either the depletion of the mineral, or devaluation, perhaps due to the increasing importance of other minerals, such as cinnabar.

The importance of the mines potentially relate to the value of the commodity being excavated and transported away, as described here. It is safe to assume that a similar procurement system existed for the sourcing of realgar, due to the findings of the mineral in the analyses shown here, but as yet there is no realgar site to the same scale as those described above. Red materials as exchange items possess very clear elite roles, considering the economic and political power their acquisition signified. Members of the elite gained and retained power and control over society, by reinforcing the validity of their power, which was supported by the sourcing, production and use of red materials. Additionally, the exchange and exchange of the shell served as a generator of capital for elite use and ascension.



Figure 22: Mines at Huancavelica (Guaman Poma De Ayala, 1980)

A prime example of this is the case of cinnabar procurement and its relation to status at the site of Atalla, Huancavelica (Figure 22, above). The site is highly unusual due to its monumental architecture, distinct in style from any contemporary local site. Attention has been drawn to its strategically desirable location; at a lower altitude than closer to the mine and with access to more arable land. It has been hypothesised that the site developed out of the demand for cinnabar from larger sites, especially important ceremonial centres like Chavín de Huantar (Burger and Mendieta, 2002: 172). Seeking to reinforce their position, the emerging elite or already established elite sought “exotic symbols of religious ideology” ensuring the development of sites like Atalla. Burger and Mendieta examined the area and made the logical conclusion that due to the advantageous position, Atalla most likely controlled the exchange of the cinnabar, and in doing so also gained elite status with control over smaller sites for example the smaller sites

closer to the source, such as Chinchimarca – the specialists that produced the pigment (*ibid*: 168).

Using a reasonable comparison of ceramics between Atalla and Chavín de Huantar, but also the differences such as the mortuary patterns, the article discusses how it was likely that Atalla was not a colony of Chavín de Huantar, but aspired to be similar to the more developed ceremonial centre (*ibid*: 158).

Chapter 7: Limitations and Further Studies

7.1 Limitations

The limitations of archaeology in Peru with regard to the environmental context lie not only in the variations of geography, between humid and arid burial environment, but also in differential treatment of the dead. This is especially important in this study as it creates a bias towards the elite. Elite burials are more likely to be preserved using mummification and high status embalming substances as well as being better preserved and easier to find due to frequent entombment within monumental ceremonial structures.

This also affects the bias in terms of what red materials appear to be more prevalent. Evidence for use of cinnabar and realgar is much more sparse than that of *Spondylus*, due possibly to the low survival rates of the organic material or soft tissue to which it is applied, or loss through overzealous conservation techniques.

In reflection of the information compiled and analysed here, there is much to be done in terms of archaeological practice in Peru, and South America as a whole. Artefacts that may be disregarded as secondary to precious metals, such as *Spondylus*, may have masses of information to relate about the pre-Columbian world. Too often, studies in South American archaeology fail to mention the specific nature of pigments or shell noted in text, which could massively impact the implications of its presence at a certain site. Similarly, the presence of red pigment, especially in the case of use as body paint found in so many burials, is often documented with no evidence for scientific identification, even when a mineral is listed. In these cases, a further oversight is the fact that a ground pigment has little adhesive power alone. It is likely that there was mixture with other materials to create a paste that would adhere to soft tissue or other materials such as the wood and metal of false heads and masks. Without these analyses of red-pigmented samples, we cannot achieve an intricate understanding of the way the pigment was used and what other ingredients might have been involved in the process.

7.2 Further Studies

As this thesis provides only a preliminary examination of this topic, it will be down to further studies to elucidate more in-depth details, such as a review of more

potential sources for red minerals. In terms of the cultural aspects of this topic there remains a broad scope to examine, for instance a more thorough study into the variation of 'elite' roles in pre-Columbian Peru. This topic could examine more in-depth the role of shamans and priests, and the division (or lack thereof, as has been mentioned here) between the spiritual elite and the secular elite.

7.22 Scientific Studies

As mentioned in section 7.1 there is a great need for more detailed and varied scientific analyses to study the fuller picture when it comes to the use of red materials. When we consider the samples from the very evidently red remains sourced from the Turin Museum of Human Anatomy and the Burrell Museum, it is clear that the red minerals examined in this thesis were not the only means of conveying a red colour to human remains.

In future studies, with the incorporation of organic analyses, it might be possible to test for other potential organic components. Based on environment, colour and suggestions from previous studies of Egyptian remains (Buckley *et al.* 2004), one of the potential sources that could be studied is the use of resin.

Conifer/pine resins can vary in colour between pale yellow and red/orange brown, with the latter being the more common. We can postulate from this that in some cases, resin may have conveyed a measure of red colour if applied to remains.

It is also important to note that resin would have supplied highly antibacterial qualities to an embalming mixture. This paves the way for potential investigations into how far the pre-Columbians understood the toxic preservative qualities of the minerals used (realgar, cinnabar), and if resin was also used, was it used for this purpose. The possibility here is that red may also have been associated with the preservation of the dead, lending the dead an almost immortal quality, or in a belief system involving an afterlife, preserving the body that might be needed.

A theory of great interest here is the possibility of the pigments being used for their toxic properties as part of a preservative recipe used to maintain the bodies of the deceased elite. It is unknown whether the ancient Andeans noticed the preservative effects of toxic materials, and if at any point this became the main reason for its use. The use of red pigment on materials other than human remains might suggest that its purpose was mainly symbolic, but the possibility exists that the act of preservation was carried out by intentional use of toxic materials.

There is also the possibility that the ancient Andeans may have associated the 'bleeding' of sap from trees with blood-like symbolic meaning. This may be especially the case if knowledge of a tree such as *Croton lechleri* (*Sangre de Grado* or Dragon's Blood tree). Although this tree is present more in the upper Amazon region of Peru, as well as Ecuador and Colombia, it is possible that word of this tree or those similar may have spread. The distinguishing element, and the one that makes this tree so relevant, is that when cut the tree releases a dark red sap as if bleeding (Taylor, 1996). The sap has been used by indigenous Amazonians for a considerable amount of time for pain relief, as well as for a number of health problems. There is the possibility that the ancient Andeans were aware of such trees, and used them in similar ways, perhaps also in the treatment of the dead.

In further studies involving other potential sources of red that would only be identifiable through organic analyses of samples, it is suggested that sponge might be a source to be examined. It has been noted that a bright red sponge has been shown to grow upon the *Spondylus* shell (Anon. 5. 2009) suggesting the possibility that this sponge may also have been used, collected as a by-product of the high rate of *Spondylus* processing. This may especially be the case if the sponge was rare, and considering the importance of the *Spondylus* it would have been associated with. As mentioned in the section on *Spondylus*, there is also the possibility that the regenerative abilities of the sponge may have been noticed. If sponge can be identified in red pigmented samples as may be attempted in future studies (Buckley, Fletcher and Hinks, unpublished data) it may be possible to discern whether the sponge contributes any red colouration. Further detailed analyses may corroborate the idea that sponge was used as a widespread ingredient



Figure 23: Red sponge growing on *Spondylus*. (Anon. 5. 2009)

Leading on from the inorganic studies here, GC-MS analyses were carried out on the same samples (Buckley, Fletcher and Hinks, unpublished data). This analyses yielded results pertaining to a widely used recipe in which resins, oils, waxes as well as some more uncommon ingredients were found. Further studies are planned to extend the investigation into the use of these ingredients and what impact these could have on the standing of red material as an elite commodity.

It was a secondary aim of this study to highlight the need for greater archaeological awareness of the importance of red materials, especially given the fragility of pigment and how easily small remains of worked *Spondylus* can be overlooked.

When sourcing the samples for this study, it was found that the hair of one of the red-pigmented individuals from the site that the Cambridge samples originated had been processed in such a way that the red pigment had been lost with no prior identification. This kind of destructive removal of pigments is well documented, especially in the case of pigment application to precious metals.

Muro and Shimada (1985) examined a number of gold burial masks, confirming that most masks had, or would have had bright pigments, most commonly layers of cinnabar covering the majority of the face (Fig. 24). They present the issue of the focus upon the aspect of gold, and the loss of pigments during restoration processes conducted to accentuate the precious metal (1985: 65).

Greater awareness of the potential importance of these pigments is needed in order to avoid cases like this.

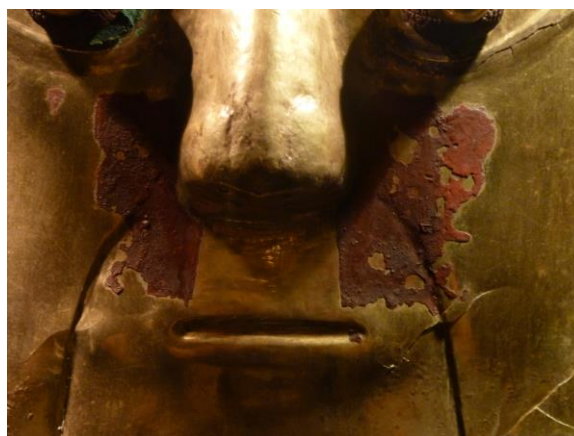


Figure 24: Mask bearing red pigment, Museo Larco, Lima [Author's photograph]

7.23 Wider Examples in the Archaeological Record

Due to the constrictions on the length of this thesis, it was necessary to attempt to keep the area of focus relatively narrow. Comprehension of the true extent to which red materials were used in an elite setting compels a brief examination of case studies from other cultures, within contentiously feasible travelling distance from Peru.

These cases including the preservation and red pigment application to female remains relate to examples found in the Peruvian record. Several of the case studies presented previously in this thesis have shown the application of red pigment to female individuals, however as also shown above, this has tended to be when included within the principal burial of a male individual.



Figure 25: Red pigmented remains at Palenque
(Gonzalez Cruz, 2000)

Excavations at the Mayan Classical Period site of Palenque, Mexico, yielded the remains of the ruler of Lakanhà (Palenque) and his wife. Relating closely to the tomb of the Señora de Cao mentioned in section 2.2, the female individual found in Structure XIIIsub in the Temple of the Skull has become known as the 'Red Queen of Palenque' due to the crimson pigment applied to her body (Fig. 25 above). Facial recognition studies carried out by Tiesler and colleagues (2004) have confirmed her identity as Lady Ix Tz'akb'u, wife of the ruler K'inich Janaab' Pakal. Entombed before her husband, Lady Ix Tz'akb'u appears to be the prototype for the pigment application, which was then used to an even greater extent on her husband's remains (Cucina and Tiesler, 2006: 36).

The composition of the red pigment has been cited as cinnabar with a small percentage of haematite, a similar recipe was used in both tombs although the layers of pigment found on the remains of Pakal are considerably more elaborate than the thin layer in the case of Tz'akb'u. Pakal is painted in layers of black and red – what has been postulated to represent night and day, or the rising and setting of the sun (Hammond, 1989). Here we see represented two members of the Mayan elite, with the more significant personage – Pakal – being more elaborately painted than his wife.

A further example of cinnabar use in the tomb of the wife of a ruler is found at the Late Classic Acropolis of Copán in Honduras. The Margarita Tomb is a spectacularly cinnabar-covered structure housing the remains of the wife of K'inich Yax K'uk' Mo' and mother of K'inich Popol Hol. The entirety of the tomb is covered with cinnabar, with the practical implements for the production and storage of pigment powder also found in the context. Furthermore, the *Spondylus* symbolism mentioned previously is illustrated here in the placement of the shell over her pelvis, possibly in a reference to its fertility and female associations (Bell, 2002: 96-9).

These case studies are by no means isolated in the field of Mesoamerican red-pigmented burial, with many additional examples; for instance the elderly male covered in cinnabar found in the ritually sacrificed or executed individuals in Tomb II of the Yaxuna Royal Tombs, or the extensively cinnabar covered tomb of a royal Mayan female at Naranjo, Guatemala – which also included *Spondylus* beads (Dacus, 2005). Likewise, archaeology and ethnography has revealed the similarity and greater intensity of bloodletting acts in these cultures (Munson *et al.*, 2014; Furst, 1976) A more extensive study would be able to expand on these links and postulate about the origin and spread of such ideologies and practices.

Conclusions

The above section reveals a hint of the true breadth of this research topic. This use of red materials reaches much further than the modern boundaries of Peru and has great potential for extensive research.

This project was limited by a number of factors without the restriction of which much more remains to be investigated. Particularly due to the space and time limitations, some areas were necessarily restrained. For instance, a much more comprehensive and detailed investigation of the individual cultures involved would have been possible, looking at the nuances of ideological ideas within them in relation to red materials and symbolism.

Given time and funding, it may have been possible to source a larger number of samples to analyse in order to achieve a broader perspective of what red pigments were being used in what areas of Peru. In order for the analyses to have been more effective, other techniques might have been used given funding and time. Ideally this thesis would have used inductively coupled plasma-mass spectrometry (ICP-MS) and/or Raman Spectroscopy. Through this it would have been possible to analyse many chemical elements simultaneously as well as more specifically identifying sources through examination of minor constituents. In order to further the research presented here, this form of analyses would be necessary, as well as analyses of the organic components of the samples presented using gas chromatography mass spectrometry (GC-MS).

The primary research question of this study was asked: how did the ways in which red materials were used by the elite of pre-Columbian Peru build and reinforce elite power?

This thesis has shown how the use of a number of red materials were highly significant, related to an intricate web of symbolism connecting the elite to the supernatural elements of pre-Columbian Peru and consequently fortifying their socio-political control.

In order to address the way in which red materials were used by the elite, this thesis has examined the cultural context, identifying a system of ideology that contains elements that make the colour red, especially in relation to blood, highly significant. By looking at the ritual practices it has been possible to associate the

use of red materials with the great value placed on blood and its use in ritual acts, aside from its inherent symbolism of life and death.

Red material was a commodity imbued with symbolic value and the ability to connect the elite to the supernatural, which was a significant factor in the legitimisation of elite power. The ritual role of the material is essential in the maintenance of power, often as an offering made by the elite as part of their religious duty to the society. It would appear that the elite position was often one of religious authority, as heads of the ceremonial and political centres, for instance in the case of the Moche elite. The discoveries of the Warrior Priest and other members of the Sacrifice Ceremony in elite tombs at Sipán and San Jose de Moro demonstrate this.

In the investigation presented here, it has been revealed how red materials represent a range of symbols, which different media display through different manners. For instance, *Spondylus* portrays fertility and rebirth through its association with female anatomy, and the blood of birth, while red pigment is applied to the body in a manner representative of birth blood.

These materials have their differences in the way they supplied elite status, with *Spondylus* being used as ornamentation of the elite. In the case of body paint this cannot be proven archaeologically, even with some ethnohistorical references, it is only proven that pigment was used on the remains of the dead.

What is clear is that through access to these materials, whether for luxury purposes or to fulfil ritual responsibilities, the elite solidified their position.

The aim of this thesis was mainly to prove that red materials were used by the elite to establish and solidify their power. Through the review of existing literature, some of which extends back to the arrival of the conquistadors themselves, it has been possible to firmly establish the symbolic and ideological value of the colour red. Out of all the materials considered, only *Spondylus* was visible in the iconographical record. It was also possible to verify the mining of ochre and cinnabar through the ethnohistorical evidence. With a good basis for understanding what materials were likely to have been used, and the socioeconomic and ideological context, it was possible to evaluate the ways in which they would have benefited the power of the elite. There is certainly room to expand on this research, through both a wider range of scientific analyses, and investigation into other possible sources of red material used by the elite.

Insofar as the space and financial constraints of this thesis could allow, the aims as presented in the introduction have been met, and the foundations have been laid for further studies to build upon. As is often the case, further research is needed to more firmly establish the connection between red materials and the elite, however this thesis has presented a well-researched argument that has worldwide application.

Appendices

Appendix A: Timelines

Cultural chronology according to Edward Lanning (Lanning, 1967) [Cultures of focus in this thesis in bold]		
Period	Date	Culture (Ceramic)
Late Horizon	1476 CE - 1534 CE	Inca
Late Intermediate	1000 CE - 1476 CE	Chimu, Chincha , Cajamarca, Piura, Chancay, Chachapoya, Chiribaya, Chucuito, Huaman Huilca, Ilo, Qotu Qotu, Pacacocha, Palli Marca, Sican , Tajaraca, Huaylas, Conchoucos, Huamachuco, Rucanas, Chanka, Aymara nations, Ayabaca, Bracamoros, Huancabamabas, Tallan, Huarco, Ichma , Parinacota, Cuntis, Chinchaycochas, Huarochiri, Kheseas, Tramas, Paltas, Camanas
Middle Horizon	600 CE - 1000 CE	Wari, Tiwanaku , Piura, Las Animas
Early Intermediate	200 CE - 600 CE	Moche, Nazca, Lima, Tiwanaku , Pechiche, Piura
Early Horizon	900 BCE - 200 CE	Chavin, Cupisnique , Late Chiripa, Paracas , Pechiche, Sechura
Initial Period	1800/1500 BCE - 900 BCE	Early Chiripa, Kotoshe, Toril

Cultural chronology according to Luis Lumbreras (Lumbreras. 1969)		
<i>Period</i>	<i>Date</i>	<i>Cultures (Ceramic)</i>
Tawantinsuyu Empire	1430 CE – 1532 CE	Incas
Regional States	1200 CE – 1470 CE	Wari, Chimu, Chincha, Chanka Confederation
Huari Empire	800 CE – 1200 CE	Wari, Tiwanaku
Regional Development	100 CE – 800 CE	Moche, Nazca, Lima, Tiwanaku, Recuay, Gallinazo
Formative	900 BCE – 200 CE	Chavin Vicus

Appendix B: Sample Images

Cambridge Samples



Appendix Figure 1: Individual 36 (Cadwallader *et al.*, 2014)



Appendix Figure 2: Individual 39 (Cambridge sample) (Cadwallader *et al.*, 2014)



Appendix Figure 3: Individual 48 (Cadwallader *et al.*, 2014)



Appendix Figure 4: Individual 28 (Cadwallader *et al.*, 2014)



Appendix Figure 5: Area of red painted skin (MNAAH)



Appendix Figure 6:
Upper torso and skull
of red-pigmented
mummy (73)
(MNAAH)



Appendix Figure 7: Red pigmented
hand (73) (MNAAH)

Huaca Pucllana



Appendix Figure 8: Female head with red pigment CFA20-14 (08) (HP)



Appendix Figure 9: Female head with red pigment CFA20 - 03(09) (HP)



Appendix Figure 10: False head with red pigment CFA20-01 (09) (HP)



Appendix Figure 11: False head with red pigment (HP)



Appendix Figure 12: Stones from outside the reed box CFA20-01 (838) (HP)

Warrington Museum



Appendix Figure 13: Head with red pigment (Warrington)



Appendix Figure 14: False skull with red pigment (Warrington)

Turin Museum



Appendix Figure 15: Red pigmented mother and child (Turin)

Appendix C: Background information of samples analysed in this study and sample pre-treatment

Table to provide background information of samples analysed in this study and sample pre-treatment				
Museum, sample and context number	Provenance	Date/Cultural Period	Sample description	Sample Treatment
Huaca Pucllana, Wari 1 Female Adult Head CFA20-14 (08)	Bolivia/Chile	Wari	Red pigment on skin of mummy – forehead area	Crushed
Huaca Pucllana Female Adult Wari 2a CFA20 - 03(09)	Bolivia/Chile	Wari	Hair/pigment cut from scalp	Not crushed (hair)
Huaca Pucllana Female Adult Wari 2b CFA20 - 03(09)	Nr. Iquique, Peru	Wari	Skin/pigment – debris from face	Already powdered
Huaca Pucllana Wari 3 CFA20-01 (09)	Rimac Valley, Peru	Wari	Red painted funerary mask (fake head) – under chin area	Already powdered Very small sample Bag rinsed with 1ml methanol to remove all material
Huaca Pucllana Wari 4a CFA20-01 (838)	Wari Kayan Cemetary, nr. Lima, Peru	Wari	Stone – pigment	Not processed by GC-MS – inorganic tests only
Huaca Pucllana	Wari Kayan	Wari	Red pigment in	Already

Wari 4b CFA20-01 (986)	Cemetery, nr. Lima, Peru		reed box	powdered
Huaca Pucllana Wari 4c CFA20-01 (833)	Wari Kayan Cemetery, nr. Lima, Peru	Wari	Red pigment in reed box	Already powdered Very small sample Bag rinsed with 1ml methanol to remove all material
Huaca Pucllana Wari 4d CFA20-01 (1030)	Wari Kayan Cemetery, nr. Lima, Peru	Wari	Red pigment in reed box	Already powdered
MNAAH 1 Red female mummy (73) Paracas	Lima, Peru	Paracas	Red pigment from mummy	Crushed in tube
MNAAH 2 Red female mummy (437) Paracas	Lima, Peru	Paracas	Red pigment from mummy	Not crushed - material not brittle enough
MNAAH 3 Red female mummy (437) Paracas	Lima, Peru	Paracas	Red pigment from mummy	Crushed
MNAAH 4 Red female mummy (32) Paracas	Lima, Peru	Paracas	Red pigment from mummy	Not crushed
Ica mummy 36 Cambridge - red and green	Lima, Peru	Late Intermediate Period	Skin with red pigment	Crushed in tube

staining on face 1003 (36)		Wari		
Ica mummy 39 Cambridge - red staining on face 1003 (39)	Lima, Peru	Late Intermediate Period Wari	Skin with red pigment	Not crushed - pigment on outside and more accessible
Peruvian false head (red), Warrington Museum	Rimac Valley, Peru		Red pigment from under chin (slightly to left)	
Peruvian skull (red), Warrington Museum	Rimac Valley		Red pigment on skin from top of right eye/orbit	
Burrell Museum 1 Chilean female mummy (red) Tarapaca	Tarapaca		'Resin'/tissue from upper arm 2.	
Burrell Museum 2 Chilean female mummy (red) Tarapaca	Tarapaca		Hair from back of head 3.	
Burrell Museum 3 Chilean female mummy (red) Tarapaca	Tarapaca		'Resin'/tissue from right mid upper arm 4.	
Turin Museum of Human Anatomy 1 Aymara Mother and Child	Cobija, Bolivia		'Resin'/tissue from mid left foot of mother 5.	

(orange-red) Cobija, Bolivia				
Turin Museum of Human Anatomy 2 Aymara Mother and Child (orange-red) Cobija, Bolivia	Cobija, Bolivia		'Resin'/tissue from centre of neck of mother 6.	
Turin Museum of Human Anatomy 3, Aymara Mother and Child (orange-red) Cobija, Bolivia	Cobija, Bolivia		'Resin'/tissue from neck/top of shoulder of baby 10.	

Appendix D: Table to show the TLE weights of samples

Table to show the TLE weights of samples				
Sample	Weight of test tube (g)	Weight of test tube and sample (g)	Weight of test tube and insoluble residue (g)	Total Lipid Extract (mg)
Cambridge				
Individual 36	8.13323	8.25404	8.25201	118.78
Individual 39	8.08567	8.12349	8.1217	36.03
MNAAH				
Sample 1	3.77272	3.77284	3.77299	0.27
Sample 2	3.70563	3.70794	3.70762	1.99
Sample 3	3.84799	3.84858	3.84848	0.49
Sample 4	3.9022	3.90222	3.90238	0.18
Huaca Pucllana				
Sample 1	3.72139	3.72719	3.72651	5.12
Sample 2a	3.75207	3.75391	3.75396	1.89
Sample 2b	3.76765	3.7765	3.77357	5.92
Sample 3	3.64896	3.64942	3.6505	1.54
Sample 4a	~ ~ ~	~ ~ ~	~ ~ ~	
Sample 4b	3.73489	3.75724	3.75712	22.23
Sample 4c	4.84229	~ ~ ~	3.84551	
Sample 4d	3.7833	3.79188	3.79181	8.51
Warrington Museum				
False Head	3.60233	3.61089	3.60964	7.31
Skull	3.6767	3.68547	3.68508	0.84

Appendix E: Table to show the specific inorganic 'spot tests' used to identify red minerals

Table to show the specific inorganic 'spot tests' used to identify red mineral in samples		
Analyte for spot test used	Chemical reaction	Equation
Mercury	A small amount of the (red) powdered sample is mixed with an equal amount of calcium oxide (lime) and the mixture strongly heated using a Bunsen burner. The red colour disappears and grey-silver mercury metal is formed if mercury is present.	$4\text{HgS} + \text{CaO} \rightarrow 4\text{Hg} + 3\text{CaS} + \text{CaSO}_4$
Iron	A small amount of the (red) powdered sample is dissolved in an aqueous solution of 20% hydrochloric acid (haematite/red ochre being at least partially soluble in a hydrochloric acid solution), before the resulting solution is made alkaline (using pH paper) with an aqueous solution of 20% sodium hydroxide, producing a red-brown precipitate of iron (ferric) hydroxide ($\text{Fe}(\text{OH})_3$) if iron is present.	<p>1. $\text{Fe}_2\text{O}_3 + 6\text{HCl} (\text{aq}) \rightarrow 2\text{FeCl}_3 (\text{aq}) + 3\text{H}_2\text{O}$</p> <p>2. $\text{FeCl}_3 (\text{aq}) + 3\text{NaOH} (\text{aq}) \rightarrow \text{Fe}(\text{OH})_3 (\text{FeO}(\text{OH})\cdot\text{H}_2\text{O}) + 3\text{NaCl}$</p>
Arsenic	A small amount of the (red) powdered sample is dissolved in an aqueous 10% sodium hydroxide solution (arsenic	<p>1. $\text{As}_4\text{S}_4 + \text{NaOH} (\text{aq}) \rightarrow \text{AsS}_3^- + \text{HAsO}_4^{2-}$</p> <p>2. $\text{HAsO}_4^{2-} + \text{HCl} (\text{aq}) + \text{CuSO}_4 \rightarrow \text{CuHAsO}_4$</p>

	<p>compounds being unusually soluble in this alkaline solution), before the resulting solution is acidified (using pH paper) with an aqueous solution of 20% hydrochloric acid. A 10% aqueous solution of copper (II) sulphate is then added, producing a blue-green precipitate of copper (cupric) hydrogen arsenate (CuHAsO_4) if arsenic is present.</p> <p>Second Test: A small amount of the (red) powdered sample is mixed with an equal amount of calcium oxide (lime) and the mixture strongly heated using a Bunsen burner. The red colour disappears and black arsenic metal which strongly sublimes is formed if arsenic is present:</p>	$\text{As}_4\text{S}_4 + 4\text{CaO} \rightarrow 4\text{As} + 3\text{CaS} + \text{CaSO}_4$
Iron	<p>A small amount of the (red) powdered sample is dissolved in an aqueous solution of 20% hydrochloric acid (haematite/red ochre being at least partially soluble in a hydrochloric acid solution), before the resulting solution is made alkaline (using pH paper) with an aqueous</p>	$1. \text{Fe}_2\text{O}_3 + 6\text{HCl} (\text{aq}) \rightarrow 2\text{FeCl}_3 (\text{aq}) + 3\text{H}_2\text{O}$

	<p>solution of 20% sodium hydroxide, producing a red-brown precipitate of iron (ferric) hydroxide ($\text{Fe}(\text{OH})_3$) if iron is present</p>	
Lead	<p>A small amount of the (red) powdered sample is dissolved in an aqueous solution of 20% hydrochloric acid (red lead being soluble in a hydrochloric acid solution), before the resulting solution is treated with an aqueous 20% sodium hydroxide solution (lead compounds being insoluble in an alkaline solution) producing a white precipitate of lead hydroxide, $\text{Pb}(\text{OH})_2$ ($\text{PbO}\cdot\text{H}_2\text{O}$)/$\text{Pb}(\text{OH})_4$ ($\text{PbO}_2\cdot 2\text{H}_2\text{O}$) if lead is present. And, in conjunction with the above tests, a small amount of the (red) powdered sample is treated with an aqueous 10% sodium hydroxide solution (lead compounds being insoluble in an alkaline solution) – if the sample is soluble it cannot be lead</p>	$\text{Pb}_3\text{O}_4 + 8\text{NaOH (aq)} \rightarrow 2\text{Pb}(\text{OH})_2 (\text{PbO}\cdot\text{H}_2\text{O}) + \text{Pb}(\text{OH})_4 (\text{PbO}_2\cdot 2\text{H}_2\text{O}) + 4\text{Na}_2\text{O}$

Appendix F: Table to show the results of the inorganic 'spot tests'

Table 1: Table to show the results of the inorganic 'spot tests' from the samples containing inorganic material	
Museum, sample number and context number	Source of mineral pigment
Huaca Pucllana 1, Wari Female Adult Head CFA20-14 (08)	cinnabar (mercury (II) sulphide; HgS)
Huaca Pucllana 2a, Female Adult Wari CFA20 - 03(09)	cinnabar (mercury (II) sulphide; HgS)
Huaca Pucllana 2b, Female Adult Wari CFA20 - 03(09)	cinnabar (mercury (II) sulphide; HgS)
Huaca Pucllana 3, False Head Wari CFA20-01 (09)	cinnabar (mercury (II) sulphide; HgS)
Huaca Pucllana 4a Stone Raw Pigment Wari CFA20-01 (838)	cinnabar (mercury (II) sulphide; HgS)
Huaca Pucllana 4b Ground Pigment Wari CFA20-01 (986)	cinnabar (mercury (II) sulphide; HgS)
Huaca Pucllana 4c Ground Pigment Wari CFA20-01 (833)	cinnabar (mercury (II) sulphide; HgS)
Huaca Pucllana 4d	cinnabar (mercury (II) sulphide; HgS)

Ground Pigment Wari CFA20-01 (1030)	
MNAAH 1 Red female mummy (73) Paracas,	realgar (arsenic sulphide)
MNAAH 2 Red female mummy (437) Paracas	realgar (arsenic sulphide)
MNAAH 3 Red female mummy (437) Paracas	realgar (arsenic sulphide)
MNAAH 4 Red female mummy (32) Paracas	realgar (arsenic sulphide)
Ica mummy 36 Cambridge - red and green staining on face 1003 (36)	realgar (arsenic sulphide)
Ica mummy 39 Cambridge - red staining on face 1003 (39)	realgar (arsenic sulphide)
Peruvian false head (red) Warrington Museum Rimac Valley	cinnabar (mercury (II) sulphide; HgS) and realgar (arsenic sulphide; As_2S_3)
Peruvian skull (red) Warrington Museum Rimac Valley	cinnabar (mercury (II) sulphide; HgS) and realgar (arsenic sulphide; As_2S_3)
Burrell Museum 1 Chilean female mummy (red)	None identified

Tarapaca	
Burrell Museum 2 Chilean female mummy (red) Tarapaca	None identified
Burrell Museum 3 Chilean female mummy (red) Tarapaca	None identified
Turin Museum of Human Anatomy 1 Aymara Mother and Child (orange-red) Cobija, Bolivia	None identified
Turin Museum of Human Anatomy 2 Aymara Mother and Child (orange-red) Cobija, Bolivia	None identified
Turin Museum of Human Anatomy 3, Aymara Mother and Child (orange-red) Cobija, Bolivia	None identified

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