Maquetas and ceremonial structures of the Mochicas in the Jequetepeque valley, Peru

A comparative analysis based on image-based 3D modeling

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Abstract

This thesis aims to use an approach based upon image-based 3D modeling in a comparative analysis of *maquetas* and ceremonial structures from the Late Moche Period in the Jequetepeque Valley, Peru, and determine if this approach is constructive in such an analyses. During this work, one particular case will be used, comparing one *maqueta* from San José de Moro to one ceremonial structure of San Ildefonso (Jequetepeque Valley, Peru). This case study will allow me to determine if image-based 3D modeling is a constructive method in a comparative analysis and to interpret the significance of the *maquetas.*

Key words: image-based 3D modeling, comparative analysis, Moche, *maquetas*, San José de Moro, San Ildefonso.

Resumen

Esta tesis aspira a usar modelos en 3D hechos a partir de imágenes como método de un estudio comparativo de maquetas y estructuras ceremoniales de la cultura Mochica durante la epoca Mochica tardío en la valle de Jequetepeque, Perú. Lo que se busca determinar con esta comparación es que si este método es constructivo para este tipo de estudio. Durante este trabajo, tomare como referencia un caso práctico comparando una maqueta de San José de Moro y una estructura ceremonial de San Ildefonso (valle de Jequetepeque, Perú). Trabajaré en este caso práctico para analizar mi método e interpretar el significado de las maquetas.

Palabras claves: modelos en 3D hechos a partir de imagenes, estudio comparativo, Mochicas, maquetas, San José de Moro, San Ildefonso.

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1. Introduction

As part of my studies, I had the chance to be an exchange student in Peru during the autumn 2013 semester where I learned a lot about the Moche culture. I excavated with the Archaeological Program of San José de Moro (PASJM) at the site of San José de Moro on the North Coast of Peru and then worked with digital data collected during the field season in the archaeological laboratory located at the Pontificia Universidad Católica del Perú (PUCP) in Lima. This experience has been extremely rewarding and helped me to define in a clearer way what I wish to investigate as an archaeologist.

During that period, I learned more about artifacts found in the burials, especially the *maquetas* –a type of clay model.[1] I became really intrigued and interested by them, their significance, if they are representations of actual buildings, and why they were put only in some graves. As I have always had a particular interest in the constructions left by different cultures and about the afterlife rituals, this thesis seemed to be the perfect opportunity to explore it through the understanding of this peculiar type of grave good.

Another of my interests in archaeology has been the more and more frequent use of digital technologies such as image-based 3D modeling, General Information Systems (GIS) databases or virtual reconstructions. Image-based 3D modeling and GIS databases are now often used during excavations to record them digitally. Virtual reconstructions are used by some archaeological projects such as the Swedish Pompeii Project or the excavation project in Çatalhöyük. These new techniques have brought new perspectives and outcomes to our discipline. The models made from pictures or from a laser scanner have proved to be powerful tools to help archaeologists in their investigations and interpretations and also for the general public, as for example virtual reconstructions help neophytes to picture more easily how past buildings could have looked. I believe myself that these tools are important in archaeology and need to be used more often in research. This is why I've decided to use digital technologies in my work as an approach to build a comparative analysis.

[1]There is no exact word in English for *maqueta* as such I will only use the Spanish word in my work.

2. General background

2.1 The Moche culture

The Mochica (also called the Moche) occupied the North coast of Peru, from the Piura valley to the Nepeña valley, from 200 to 850 AD (figure 1). This region is a desert but every 50 kms, more or less, there is a valley. The Mochica developed inside these valleys, and they are one of the most documented cultures of the Pre-Inca period. Their ceramics and others artifacts, have now been studied by archaeologists for more than a century. The artifacts come from the excavations of structures such as pyramids, platforms, and urban centers... and also from cemeteries, unfortunately most have been at least partially looted. Two different chronologies have been used to define the different periods of the Moche culture. The first, proposed by Rafael Larco Hoyle, is based on ceramic development and has 5 different phases. Luis Jaime Castillo proposed another one, as the chronology proposed by Larco isn't valid in the northern Moche valleys.

Figure 1: Map of the main Moche sites (Adapted from Quilter & Castillo)

As my work will be focusing on the Jequetepeque valley located in the Northern Moche valleys (fig.1), I will use this chronology. Luis Jaime Castillo and Christopher Donnan proposed 3 different phases: Early Moche (ca100-400), Middle Moche (ca 400-650) and Late Moche (ca 650-850). It is important to note, that every valley had different developments and the dates of the chronologies differ depending on the valley. The dates mentioned before are only an approximation to have a clearer idea of which time period I will be talking about in my work.

As every Pre-Colombian culture in the Andes, the Moche didn't have a writing system, which makes it difficult to know for a fact the political and social organization of the Moche. Nonetheless, it is possible through the archaeological and iconographic objects to have an idea of how the Moche society could have been organized. First of all, it appears from the study of the Moche burials that it was a very ranked society. Warriors, priests and priestesses were members of the elite. The discoveries of the extremely rich burials such as El Señor de Sipan and La Dama de Cao made scholars rethink the social organization of the Moche society as they had been identified not as warriors or priests but as "gobernantes" (rulers), individuals with a higher status. Then come the artisans, they could be, for example, weavers or potters. They were probably working for the elite. At the bottom of this hierarchy were peasants, fishers, and livestock farmers. There is little information about this part of the Moche society: almost no representation in the iconography and researches conduct the majority of their work on other aspects of the Moche society (Goepfert, 2011: 69-75).

When it comes to political organization, different models have been proposed. One of them suggests that the valleys are all independent. Another one proposes that two independent states existed, one in the south and one in the north. Finally, the last suggestion is a unified and centralized state (Goepfert, 2011: 76). Recent researches let to these conclusions: the Southern Moche was a centralized state ruled from the Huacas of Moche. Religion and rituals was important in this process through ceremonies such as sacrifices or ritual combats to highlight the power of the rulers (Castillo & Uceda, 2007: 10). The Northern Moche developed during Early, Middle and Late Moche phases in the Lambayeque and Jequetepeque valleys (Castillo & Uceda, 2007: 11). In the Lambayeque valley probably was the location of different kingdoms. Differences between the Jequetepeque valley and the Southern Moche can be traced in the funerary practices: in the Jequetepeque valley (where the sites of SJM and

San Ildefonso are located) 3 different types of burials were uncovered- rich chamber burials with niches, boot shaped shaft tombs and poor pit tombs- while in the south mostly small chambers and pit burials were discovered (Castillo & Uceda, 2007: 13). Nonetheless, Donnan suggests that the Mochica were united through religion and rituals (Donnan, 2010). One of the most important rituals to the Moche seems to have been the funerary rites. It is also one of the most documented rites through the archaeological excavations of cemeteries and also thanks to the iconography found in the Moche ceramics, particularly on the Moche fine line wares.

My work will focus on a peculiar type of grave good that was found in the burials of San José de Moro (SJM). The site is located in the northern part of the Jequetepeque valley, north of the city of Chépen in the department of La Libertad, Peru (fig.2). The Archaeological Program of San José de Moro (PASJM) has been excavating the site of San José de Moro since 1991. San José de Moro has been interpreted as a cemetery and a regional ceremonial center. The objectives of the project are to study the funerary customs of the populations that inhabited the area and study funerary patterns in order to infer social and regional organization, to study the relationships between funerary practices and other activities, and establish the ceramic traditions associated with the different occupational periods of the site. With that goal the PASJM has also started to excavate the other sites in the Jequetepeque valley such as San Ildefonso and Cerro Chepén. These sites present different types of structures (Castillo, 2001).

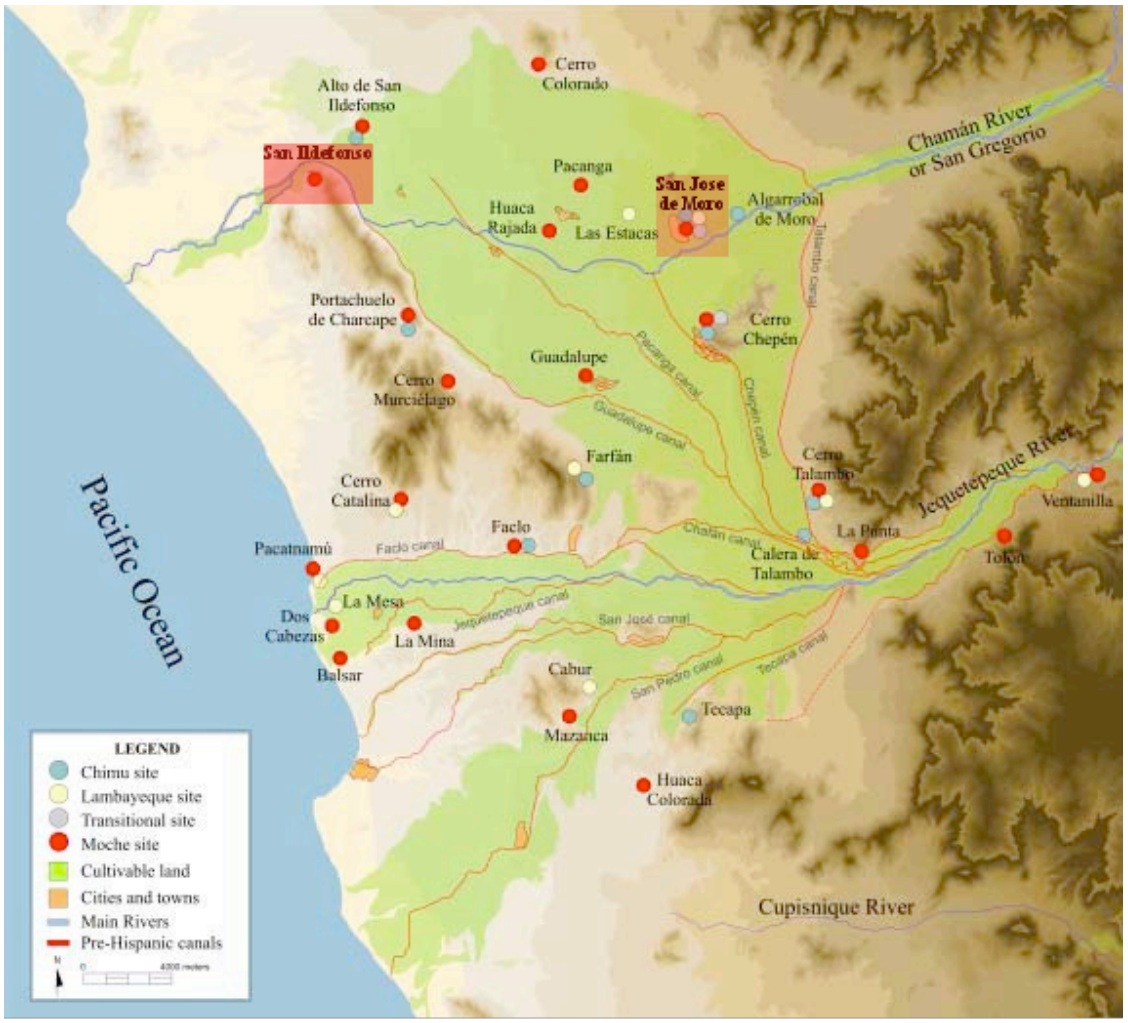

Figure 2: Map of the Jequetepeque Valley with major archaeological sites, the sites that will Be used in my work are highlighted (adapted from PASJM)

Throughout years of excavations in San José de Moro, many tombs have been found. The tombs have been discovered with a variety of grave goods. Some of these deposit materials were the *maquetas*. The first ones were found during the excavations in 1991-1992 and later in 2007 (Castillo et al., 2011:120-124). It seems important to explain here that the site has sheltered many graves and that it is the site where the first burials of elite Mochica women were found. In fact, the peculiarity of the site resides in that the elite tombs that were uncovered, belonged mostly to women. The tombs uncovered at SJM are of different types: *tumba de camara* or chamber tombs with the niches where the elite were buried, the boot tombs where the upper class of the society was buried, and finally pit burials that were for the lower class members of the society. Donnan and Castillo identified some of the individuals of chamber tombs as priestesses based on the objects and individuals associated with them (Donnan & Castillo, 1994). As I've written before, the site has been interpreted as a regional

ceremonial center for the Jequetepeque valley. It is thought that the inhabitants from sites such as San Ildefonso, Cerro Chépen or Portachuelo de Charcape came to San José de Moro to perform specific rituals and to bury their dead. In fact, it can be noticed that in some of the burials corpses have been moved. They would have been buried a first time when the death happened and then reburied or they could have not been buried but held in "storage" in SJM during specific ritual ceremonies. The fact that SJM could have been used as a regional ceremonial center and that the occupants of the elite burials were predominantly women, lead researchers to think that the Jequetepeque valley, during the Late Moche Period, could have had women as rulers. It is important to note that other burials of elite Mochica women have been uncovered in others sites that are not located in the Jequetepeque valley. However these women don't seem to have the same status and artifacts as the "priestesses". San José de Moro was an important regional ceremonial center that was reoccupied by various cultures (Moche, Transitional, Lambayeque, Chimú and Inca) and is the only large-scale cemetery found in the Jequetepeque valley.

I mentioned above that I would focus my interest on a particular type of grave good: the *maquetas*. They are unique artifacts. The ones belonging to the Moche culture have only been excavated in San José de Moro. Other Moche *maquetas* exist in private collections but they are without any archaeological contexts. Every *maqueta* is unique but they do share some similar characteristics such as a divided interior space and in some of them there are benches, platforms or ramps. None of them has external elements. They all have a roof and traces of red, black and white paintings. They can be defined as "clay architectural models" (McClelland, 2010:209). They are rare as they are unfired clay objects, which make them perishable and therefore extremely fragile.

Through the years a number of articles, and more recently books, have been published about *maquetas*. Luis Jaime Castillo Butters published a few articles on the subject in 1995, 1997 and 2012, while Donald McClelland also published some in 2010. In 2012, a book titled *Modelando el Mundo: imagines de la arquitectura precolombina* edited by Cecilia Pardo, talks about the *maquetas* from the Ancient cultures of Peru (Moche, Chimú, Inca). Juliet Wiersema wrote her PhD dissertation about architectural vessels in the Moche culture including *maquetas*-she calls them "architectural maquettes" (Wiersema, 2010: 136). In all these publications, the principal queries are first to know if the *maquetas* are scaled representations of real architectural structures, and second if they are prototypes used by

architects before building the full-scale building. The answer in the case of the Mochicas is that the *maquetas* are probably scaled representation of ceremonial buildings with a symbolic function. Different methods have been used to draw these conclusions but image-based 3D modeling has never been employed as one of them.

As I mentioned before, the PASJM has also conducted excavations in others sites of the Jequetepeque valley such as San Ildefonso. The site is located on the western side of the Cerro de San Ildefonso, in the desert zone adjacent to the mouth of the Chamán River in the Jequetepeque Valley. San Ildefonso is located west of the site of San José de Moro (fig.2). My work will be focusing on the structures of this site that have been mentioned in some general publications about the North Coast of Peru, such as by Donnan (1990). More recently, Tom Dillehay (2001) has published some of his research about San Ildefonso, as well as Castillo (2005), and Edward Swenson (2004, 2007, and 2010). Swenson's work has been focused on the spatial organization of the architecture and its functions, with a special interest on the ceremonial buildings with ramps.

2.2 Digital technologies

Over the past decades, archaeologists have been using digital technologies in their projects more and more often. These techniques have been used during the excavation process to document it, but also for analysis and virtual reconstructions. I will briefly present some projects that have been using these techniques. These projects are only a few examples of the many projects that had used or are currently using digital technologies in their research. It is of course a non-exhaustive list of examples.

In many Cultural Heritage projects, digital technologies are used with the goal of creating a virtual reconstruction of a site both to help the researchers in their work, to document the current condition of a site that is deteriorating, and also to allow the public to picture how a site could have looked at a precise time or to visualize some details of sculptures for example.

A group of scholars has worked on the virtual reconstruction of the entrance of the Ripoll Monastery, Catalonia, Spain. Their goal was to use different scanning techniques to build a virtual model of the Roman sculptures at the entrance of the monastery and to give visitors

access to details and to allow them to navigate between the different parts of the entrance (Besora et al., 2008). Another group of scholars' work was to realize an image-based reconstruction of the Great Buddha of Bamiyan, Afghanistan. Their goal was to reconstruct this statue virtually by using different types of images, the statue was built between the 2nd and 4th century and destroyed by the Taliban in 2001 (Gruen et al., 2003). These two examples show that digital technologies can be used as analysis tool, as a tool to show public a specific site and also as a preservation tool.

Archaeologists have been using digital technologies to document the excavation process and to assist with archaeological analysis. I will here talk briefly about a project that used these techniques at the site of Tambo Colorado, Peru. It is one of the best-preserved Inca site on the Peruvian coast. The goal of the project was to develop a digital documentation using different techniques such as photography or laser scanning and at the end integrate all the data in a virtual reality system (Forte et al., 2005).

These few examples show how digital technologies have been used for different outcomes and perspectives. Digital technologies have mostly been used to document excavations, to create a virtual environment and as a tool to show a site in a different way to the public. It would be wrong to reduce the use of these technologies to only the different purposes mentioned before and I believe that a lot more can be done with it. Digital technologies offer the possibility to go further in research by enabling the user to see some more details. It can be used in many different ways such as a comparative tool.

3. Problem formulation

The purpose of this thesis is to use image-based 3D modeling in a comparative analysis of *maquetas* found in burials from the Late Moche Period in San José de Moro and architectural structures found in the site of San Ildefonso and to see if the use of this method can be constructive in a comparative analysis.

Can the use of image-based 3D modeling bring different perspectives and outcomes to the study of *maquetas*, focusing on the comparative analysis of their architectural features: walls, terraces, and ramps? How is the use of image-based 3D modeling constructive in a comparative analysis?

Is it possible to determine if the *maquetas* are representations of actual buildings? If they are, why did the Moche place them in the tombs? Were they models used by an architect before a construction and then placed in the tomb as a reminder of her position in the Moche society in the afterlife? Or were they objects with a symbolic significance, put in the tombs of people having a religious importance in the Moche society?

4. Choice of materials and method

4.1 Method

My method will consist in a comparative analysis based mostly in image-based 3D modeling. Image-based 3D modeling is a technique that consists in taking pictures all around an object. Then these pictures are post-processed in a software that aligns them to reconstruct in 3D an object or a building. I chose this method over laser scanning for different reasons. The first one is that I do not believe that laser scanning would have been helpful or even useful for my research. Mostly because I don't think that the scanner would be able to scan properly the the structures and due to conservation conditions I knew that it would have been extremely difficult to scan the *maquetas* without breaking them. Secondly, the data from laser scanning can be more difficult to work with. And finally, the PASJM did not possess any scanners when I was in Peru and had the chance to work with the *maquetas*. Anyhow, image-based 3D modeling also has disadvantages such as the pictures need to be taken correctly and enough pictures need to be taken to make a fine 3D model. This is important to have in mind especially when the objects photographed are located in a different country than where they will be used for post-process work.

I will compare the 3D model of a *maqueta* from San José de Moro with a 3D model of a specific architectural structure from San Ildefonso. To make these models, I will be using the software "Agisoft Photoscan", a simple software used to create image-based 3D models. I will compare features such as the corresponding walls and ramps shared between the structures. To do so, I will use the software "Autodesk 3dsmax" that provides tools such as moving or rotating an object for the purpose of placing the *maqueta* in the landscape of San

Ildefonso. Besides the use of image-based 3D modeling, I will use different sources such as the representation of architectural structures in the iconography.

4.2Materials

I will work with data from the PASJM in order to make the image-based 3D models of San Ildefonso. During the excavations in 2007, 8 *maquetas* were found in the burial M-U1525. In 2008, 3 of the 8 *maquetas* were restored (Mauricio et al., 2008: 98). When I had access to them in the archaeological laboratory of the PUCP in Lima, I've chose to take pictures of only the 3 restored *maquetas.* I selected these *maquetas* because they were the best preserved, and for my work, I needed to have the most complete *maquetas* to be able to make the best image-based 3D models possible to analyze and interpret them. All the *maquetas* had a roof that through time broke apart from the rest of the *maquetas*. For this reason I took pictures without the roofs and excluded them from the models. I could have easily rebuilt the roof of the *maquetas* using techniques of virtual reality. But as the structures that I compared them with had no roof, I chose to eliminate that option. Later on, I decided to produce only one case study and therefore worked with only one *maqueta.* The *maqueta* I've selected is the *maqueta* 01 found on the floor of the tomb. I took the pictures of the *maquetas* in the archaeological laboratory of PUCP in Lima in December 2013.

During the 2013 season, the PASJM used a drone- type DJI S800 hexacopter with a gimbal to take pictures, taken with a camera Sony Nex 7- to map the sites of San Ildefonso and Cerro Chepén. All the photos I will use to make the 3D models of the sites were taken with the drone in July and August 2013. I will focus my interest on San Ildefonso as the sites present the structures that are the most similar to the *maquetas.*

My other sources will mostly be the reports from the excavations conducted by the PASJM and articles produced by the project. I will use some other publications on the Moche architectural vessels, the site of San Ildefonso as well as some general publications about Peru and *maquetas* from different pre-Hispanic cultures of the Andes. I will also include iconography as one of my sources. I believe that iconography is an important tool to use to understand a culture such as the Moche didn't have a writing system but produced a lot of Moche fine lines ceramics.

4.3 Critical Aspects

Most of the data that I am using has been collected by others and with different methods than the ones I would have used. One of the difficulties I encountered with the data during my work process was to find structures with similarities to the *maquetas.* Reading through the excavations reports from 2007 to 2009, I learned that some structures of San Ildefonso were very similar to the *maquetas* I was using for my project. I decided to focus my work on these structures. My main problem was that the data collected by the drones was classified with the days the pictures were taken, not by which part of the sites they were from. To any person exterior to that campaign acquisition or to the PASJM, it seems extremely difficult and time consuming to uncover which day corresponds to which sector. I would have found it easier to have them classified with sector direction north, south, east, or west for example or with the number that the PASJM assigned to each sector in its reports.

My research was based on the data provided by the PASJM. It is important to mention in this section that they only mapped a small part of the site. The campaign acquisition done by the PASJM during July and August 2013 covered partly the sectors north, central and south of San Ildefonso. Therefore, the pictures didn't represent all the structures that could have been used in my comparative analysis.

I also realized that I was lacking some data that I would have liked to have. I would have liked, for example, to have markers on the pictures where GPS points would have been collected so I could have geo-referenced my work. I know that GPS points have been taken by the PASJM but I wasn't there when they took them and there are no markers on the pictures, which made it impossible for me to geo-reference my work. Also I didn't have access to the map containing the GPS points. If my work could have been geo-referenced, it would have been easier and better for me to align the *maqueta* with a real structure. Also, geo-referenced models would have been better to measure and scale the structures in San Ildefonso and therefore the *maquetas.*

The softwares that I am using in my work are more or less easy to use but they are time consuming. "Agisoft Photoscan" that I used to make the 3D models takes a long time to process, depending of the quality of the 3D model it can take between 5 to 10 hours to

process. Also some softwares crash during the working process, if the work hadn't been saved correctly work is frequently lost and the process must be re-started from the beginning.

Another critique that I can address here is the fact that I will only work with one case study to evaluate my method. Due to matters of time, I couldn't work with another structure and *maqueta*. However, I think that the structure and the *maqueta* I have chosen to work with are representative for my research as the purpose of my work is to show how image-based 3D modeling can be constructive in a comparative analysis. Nevertheless, I am aware that it would be necessary to apply this method to all the structures and *maquetas* encountered to create a more scientific, precise investigation. I am also aware that my results can only be certain for my case study and then my others conclusions are suppositions and extrapolations. Therefore more work, with the *maquetas* and the structures of the Jequetepeque valley will be needed to draw better conclusions.

5. Theory

I will present in this part of my work, the different theories that will be useful for the interpretation in my thesis.

5.1 Digital Archaeology

Digital technologies have deeply impacted archaeology. During the past decades, archaeologists have used new tools and instruments for the documentation, analysis, and visualization of archaeological sites. More and more archaeologists are working with new techniques such as 3D modeling and virtual reconstructions based on photographs or scanning and Geographic Information System (GIS) databases. Some of them are identifying themselves as "digital archaeologists" that communicate and are building digital databases (Morgan & Eve, 2012). Even though some archaeologists think that way, a debate is going on among them to categorize it as a theoretical school or as a specialization. Thomas L. Daly and Patrick Evans consider the approach as: "a way of better utilizing computers" (Daly & Evans, 2006: 2). Ezra B.W. Zubrow also talks about two views, one that is a method and the other one that is a development that influences archaeology (Zubrow, 2006: 9). The first ones think that digital archaeology just provides another group of tools to answer problems.

Zubrow thinks that post-processual archaeology and digital archaeology are not compatible

(Zubrow, 2006: 14). On the other hand he thinks that cognitive archaeology is compatible with digital archaeology (Zubrow, 2006: 15). Cognitive archaeology can be defined as "the study of the past ways of thought as inferred from material remains" (Doran, 1996: 1232). That means that cognitive archaeologists study the way of thinking of the past individuals and they consider that individuals can share a way of thinking such as common sense knowledge (Zubrow, 2006: 15). Digital archaeology therefore is useful to cognitive archaeologists as it provides them with tools to model individuals' goals in the past. (Zubrow, 2006: 15). The different tools that provide digital technologies to archaeologists allow them to experiment and reconstruct environments for instance. Doran writes that we need to be systematic and consistent in our experiments and the results can "cast light on social processes" (Doran, 1996: 1244). According to Daly and Evans, with digital archaeology repetitive approaches can be used and it is possible to apply abstract ideas (Daly & Evans, 2006: 223).

I agree with their point of view. I think that digital archaeology cannot, *yet*, be classified as a method or as a theory. I believe that it is an approach that provides different tools to archaeologists and influences their way of thinking and therefore their theory. Different archaeological projects have now been integrating digital techniques such as documentation, GIS databases, or virtual reconstructions in their fieldwork. One of the many examples of this is the project on the site Tell Acharneh in Syria. The researchers from Laval University (Quebec, Canada) think that field archaeologists document their work in 2D representations and not in 3D due to the lack of low cost and easy use software (Losier et al, 2007: 272). They present in their articles the methods, software they used in their project, and their results. They proved that using digital archaeology as an approach had many advantages and good results such as seeing trenches in more realistic manners, it helped having a better understanding of the site, the possibility of seeing the different layers of the excavations simultaneously, etc. (Losier et al, 2007: 283). Çatalhöyük is an archaeological project that chose to "virtually reproduce the entire archaeological process of excavation using 3D technologies" (Forte et al., 2012: 353). During the excavations, technologies such as laser scanners or photogrammetry are used to record all the data and post-process it during the excavations and not after. The idea is to have the data available for every member of the team during the excavation process and increase the discussion and the capacity to interpret the data. (Forte et al., 2012: 355). Digital technologies are used in this project as a methodological approach during the excavation process. Their focus is not on the technologies themselves but on what they can bring to the excavation process.

In the case of my thesis, I stress that digital technologies such as image-based 3D modeling will show different aspects of the *maquetas* and their relation to the structures of San Ildefonso. They will probably also confirm the work of others scholars. In my work, I will use image-based 3D modeling as a tool.

5.2 Representation theory

One of the main interrogations in my work is to know if the *maquetas* are representations of the Moche society. The online Oxford dictionary defines representation as "the description or portrayal of someone or something in a particular way**"**. To understand this concept of representation it is important to understand that it links meaning with culture (Hall et al, 2013: 1). Members of a culture produce language, signs, images, and objects that they exchange between them. They have a meaning for the members of this society; it means that these productions stand for something or represent things among them (Hall et al, 2013: 1). Different theories have been developed around representation: the reflective approach, the intentional approach, and the constructionist approach (Hall et al, 2013: 10). Scholars in the field of cultural studies have elaborated these theories, exploring modern cultures and the impact of representation on social and political changes. I will only expose here the reflective approach as I found it to be the best suited for archaeology and for my research. The reflective approach is defined as "thought to lie in the object, person, idea or event in the real world (…) to reflect the true meaning as it already exists in the world" (Hall et al, 2013: 10).

According to this approach, objects, monuments or paintings made by a specific culture somehow carry the reflection of something that exists in the world. Pierre Bourdieu in his essay "The Kabyle house or the world reversed" explains how the organization of the house reflects the organization of the society. His work shows that the division of the space in the house is representative of the division of the society between sexes, such as the division of labors and the opposition between private life and the public life (Bourdieu, 1979: 138-142).
He also mentions how the spatial organization of the house is related to the beliefs and rituals of the society. For example, for the Kabyles the weaver loom had a magical protection, it was also the symbol of the male protection (Bourdieu: 1979, 137). The house, a building made by men of the Kabylia culture, is the reflection of the organization of the society and therefore

the representation of something in the real world. It is also the representation of the beliefs in that society. I argue that the interpretations that Bourdieu does of the Kabyle house can be applied to another society and to others buildings. Here it can be applied to the Moche society that is, as I have previously mentioned, the Moche society was organized with a strict hierarchy that can be noticed by the restricted access to some parts of the Moche temples. During the ceremonies performed in the ceremonial structures, certain areas of the temples had a restricted access to only the priests/priestesses. For example, archaeologists think that the access to the Ceremonial plaza in *Huaca de la Luna* was restricted to a group of people because of the surrounding walls and the sole controlled access. The access to the upper platform and then to the main altar was through corridors and ramps and there again the access was restricted probably to only priests to the upper platform and to the main altar it was restricted to only high priests (Uceda et al, 2009: 23-33). Some scholars talk about "authorized and authorizing" space in the ceremonial structures in San Ildefonso (Swenson, 2004: 425).

The Moche society didn't have a writing system but they did produce a large amount of objects and iconography that can help archaeologists interpret their culture. Elizabeth Benson is a scholar that has been studying the Moche iconography and comparing it with archaeology. Her work is interesting as it shows the importance of linking both archaeology and iconography to completely understand the Moche world (Benson, 2008). Benson writes "iconography (…) has special symbolic language rules" (Benson, 2008: 2), this idea is extremely important as their iconography can be considered as their writing system and used this means to communicate ideas among the society. Anne-Marie Hocquenghem talks about the function of the iconographic objects, saying that they have both a utilitarian function and a symbolic one as they were mostly found in elite tombs (Hocquenghem, 1983: 11). Objects have a symbolic function and they convey ideas, stories and myths into a physical reality (DeMarrais et al., 1996: 16) because they are the materialization of the ideology of a culture. In fact, cultures do not create objects nor build monuments without a reason. They do so to materialize a way of thinking or/and ideology (DeMarrais et al., 1996). Materializing ideas and ideology into monuments or objects is a sign of power and the hold the elite had on the rest of the Moche society.

Following these ideas will be the base of my development to interpret the *maquetas,* to define if they are representation of a structure existing in the real world and to understand why the

Moche made such objects.

5.3 Ritual Theory

Ritual can be defined as "structured and repeated performative action (…) that can imply a considerable number of participants with importance of the location" (Renfrew, 2007: 115-116). In archaeology, ritual has often been used as a label for the unaccounted. Archaeologists have always borrowed theory from other social sciences and applied them to the needs of their discipline. When it comes to the study of rituals, researchers in the field of ritual studies have produced most of the theory and it is this theory that archaeologists have been using in their work (Berggren & Nilsson Stutz, 2010).

This means that archaeologists have been using theories made from studies of historical and contemporary communities but archaeology is the study of material left by past cultures, which can make it more difficult to draw conclusions about ritual practices (Berggren & Nilsson Stutz, 2010: 172). Recently, more and more archaeologists have shown that archaeology based on the material record can make its own theory and take part in ritual studies (Berggren & Nilsson Stutz, 2010; Swenson 2006-2008). Catherine Bell -a religious study scholar- focused her work on practice. Her work has had an impact on archaeology as many archaeologists used her work even though their interpretation can differ from her thoughts. In her work, Bell talks about "ritualization", she defines it as "a strategic way of acting and then turn to explore how and why this way of acting differentiates itself from other practices" (Bell, 1992: 7). As this way of acting creates a difference to other actions, it defines this act as ritual, which means a powerful, significant act (Bell, 1992: 90). Åsa Berggren and Liv Nilsson Stutz have based their work on Bell's ideas and they explain this choice for different reasons, the main one being that focusing "on practice is important for its application in archaeological interpretation process". They argue, using two case studies from Scandinavian prehistory that the application of practice-based ritual theory can show how this framework can be connected to archaeological sources. In their conclusions they say the past can be interpreted in new ways and that actions structured the lives of people (Berggren & Nilsson Stutz, 2010: 191).

Edward Swenson is another archaeologist studying ritual that has been influenced by Bell's

work. He also argues in his work for a new approach. His idea is to use a methodological approach to explain the political significance of religious behavior and to trace the ritual practice (Swenson, 2008: 237). His work concerns rural settlements in the Jequetepeque valley (North coast of Peru) during the Late Moche Period (AD 550-750). He focuses on identifying and interpreting contradictions in material, in his work he focuses on intermediate-scale ceremonial sites (Swenson, 2006: 116; 2008: 238). In his work, Swenson shows the relationship between rituals and power. He interprets the artifacts found on the surfaces of multi-terraced platform mounds with ramps, as well as the spatial organization of these sites to be signs of organized rituals (Swenson, 2008: 242-243). He illustrates through the use of a "comparative analysis of disjunctive ceremonial space" that the fragmentation of the center into different levels of terraces can show the differentiation of power based on the participants position, highlighting the political aspects of ritual practices. Others scholars also mention the importance of the placement of Moche ceremonial structures in the Moche religion and society (Wiersema, 2010: 213).

Their different approaches are particularly interesting for my research and my interpretation of the significance of the *maquetas*. In fact, all scholars that have studied the *maquetas* draw the same conclusion that they are some symbolic objects with a ritual meaning (Castillo et al, 2011: 130; McClelland, 2010: 228; Wiersema, 2011: 165-166). I believe that to be properly understood the *maquetas* need to be studied as symbolic and ritual objects. With that purpose, the approaches of Swenson, and Berggren and Nilsson Stutz are important as they show how to apply Bell's work and highlight ritual practices that I think are the key to understand the ritual importance of the *maquetas*.

6. Maquetas of San José de Moro: case study

My case study will focus on the comparison of one *maqueta* and one ceremonial structure of San Ildefonso. The goal of this case study is to establish if image-based 3D modeling is a constructive method in a comparative analysis.

6.1 Archaeological context

Before talking more in detail about my case study, it seems important to mention the

archaeological context in which the *maqueta*s were found. They were found during the 2007 field season in the tomb M-U1525 dated from the Late Moche Period and categorized as a *cámara de adobes* or chamber made out of sun-dried bricks. Ana Cecilia Mauricio (Mauricio, 2007-2008) mentioned 11 individuals for the tomb and detailed their sex and age. Buried in this tomb were two females interpreted as the principal individuals, accompanied by two infants, one child, four women, and two men. One of them was aged between 25-32 years old when she was buried. She was placed at the entrance of the tomb while the second main individual was placed at the back of the chamber. She's been interpreted as "priestess" because of the artifacts that accompanied her in the burial. She was in a wooden coffin covered in metal. Her body was found with a metal cup and part of a crested headdress (fig.3) Sacrificed individuals also accompanied her. The copper cup had a lot of similarities with the goblet depicted in the Sacrifice and Presentation Ceremony on Moche ceramics and used by an anthropomorphic female supernatural (fig.4). This ceremony was a ritual of human sacrifice (Moche warriors) that had been defeated and their blood was offered to the god.

Figure 3: The main individual in the tomb M-U1525 interpreted as a priestess, on the right next to her head we can see a piece of the headdress and further down we can see a copper goblet (adapted from Mauricio et al., 2007:127).

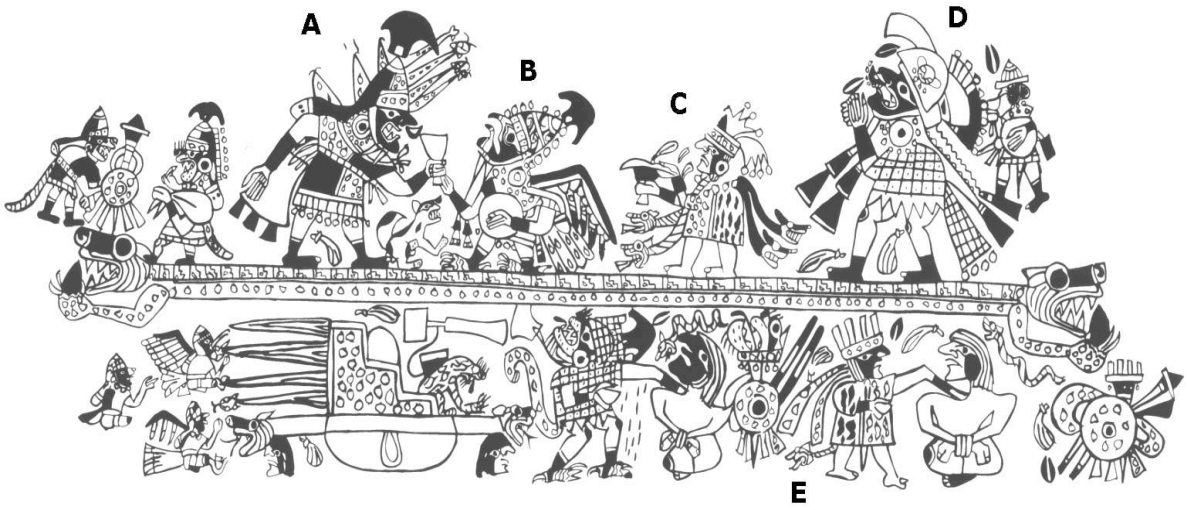

Figure 4: Detail of the Moche Sacrificial Ceremony: the deity C is interpreted as an anthropomorphic female supernatural, she wears a dress, a headdress and holds a cup (drawn by Donna McClelland)

Also the sacrificed individuals are interpreted as the entourage of the priestess during funerary ceremonies that are depicted on the Burial Theme (Castillo, 2005). The artifacts and the individuals that accompanied this individual made the archaeologists interpret her as a priestess. Besides, to have such a rich burial suggests an important social involvement during the burial rituals to build the grave, to sacrifice the humans and animals that accompanied the main individual and the wealth in the tomb. It also suggests that the main individual must have had an important status in the Moche society.

I agree with the interpretation that the main individual in the burial M-U1525 could have been a "priestess" because of the resemblance of the artifacts and individuals that accompanied the main individual in the tombs as well as the richness of the burial suggest a person with high status in the Moche society. *Add something about link with iconography.*

The second notable individual was aged between 24-34 years old and her body showed signs that she has been moved to San José de Moro and it wasn't the first place where she was buried. She is also believed to belong to the elite. She was buried in a coffin that presented decoration of a Moche priestess but the only artifact found with her was a piece of a possible wooden stick. The grave goods, placed in niches and inside the tomb, were composed of human bones, possible llama bones, an enormous amount of *crisoles* (particular type of

ceramics found in that region of Peru), some ceramics called *cántaros* (ceramic jars) and *tazones,* some stirrup bottles and 8 *maquetas* (figures 5; 6 & 7). Two of the *maquetas* were found in niches and the rest on the floor of the chamber (Mauricio et al., 2007).

Figure 5: one of the *maquetas* found in the niches during the excavation,
on the right side there are some *crisoles* (Adapted from Mauricio et al., 2007: 102)

Figure 6: the *maqueta* 01 after restoration with the roof (adapted from Castillo et al., 2011: 129)

Figure 7: one of the pictures of the *maqueta* 01 used to make a 3D model (photo: Cléa Moulin 2013)

Swenson, for his work about the urban hinterland in the Late Moche Jequetepeque, has identified a large number of sites, among them San Ildefonso. In his work, he mentions the site as JE-279. He divided the site in different structures and registered all the structures with a total station (fig.8). He conducted some excavations of test units in the platforms C-1; C-2 and C-2 west; C-3 and D-1 (Swenson, 2004: 1101-1125).

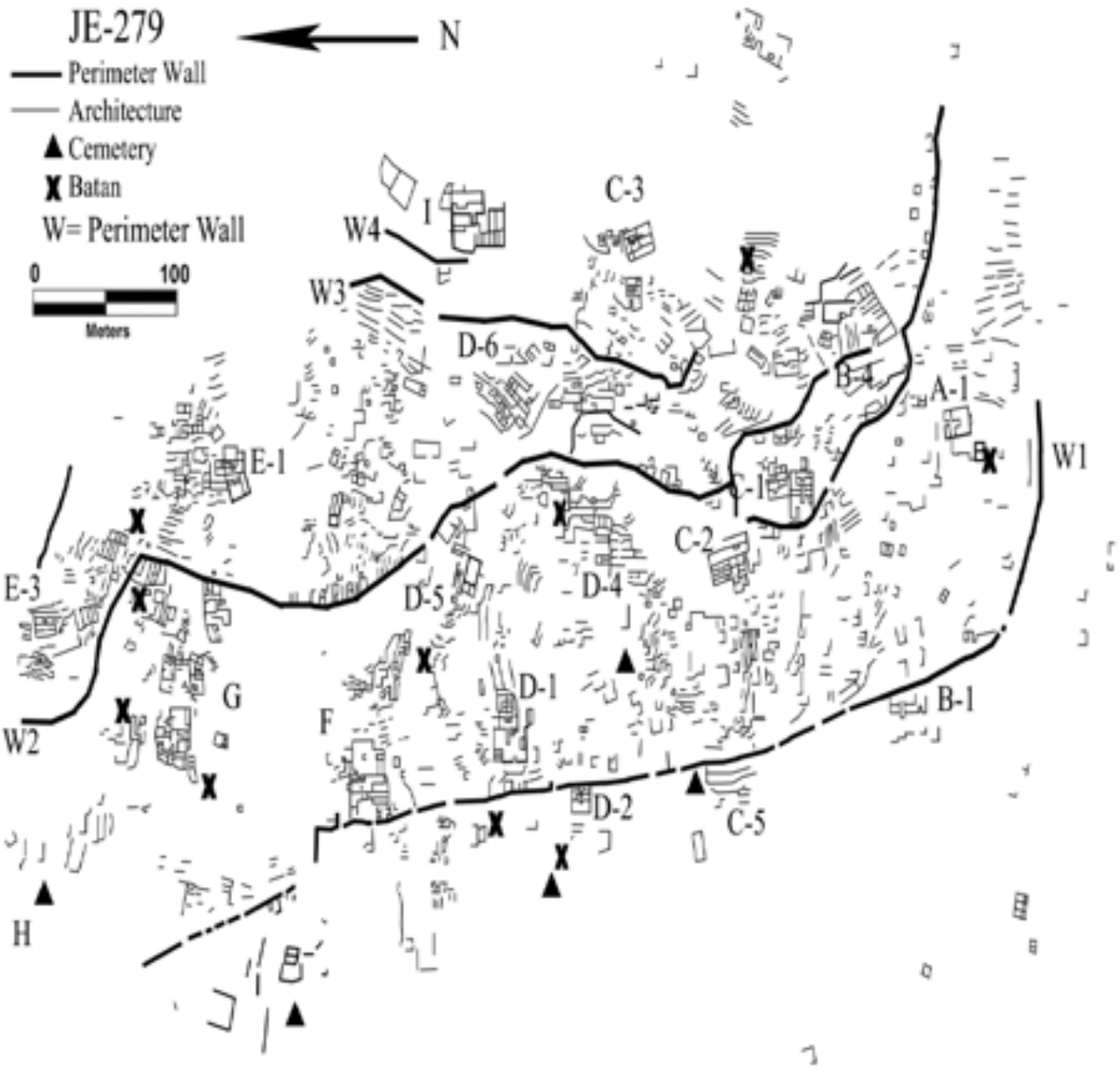

Figure 8: Architectural map of San Ildefonso (Adapted from Swenson, 2004: 443)

The PASJM excavated superficially the north part of the site, named sector G by Swenson (fig.8). The objectives were to create a topographic map of the sector as well as collect ceramics to be able to date the site (Cusicanqui, 2010: 103). In the publications of the PASJM it is named sector 4 and described as the "more complex sector" of the site (Cusicanqui, 2009: 62). This sector is located between the first and second ramparts (on figure 7, they are named W1 and W2). The structures were built with stones which differed from the traditional Moche temples and ceremonial centers that were usually made of *adobes*-sun dried bricks. I decided to focus for my attention on the platform G-3 for my case study (fig.9). The PASJM mentioned in its publications the similarities between this platform and the *maqueta* 01, as I

could only focus my work on one structure and one *maqueta* I decided to work with this structure. I will then be testing the hypothesis made by the PASJM about the link between this structure and the *maqueta*.

Figure 9: Aerial picture of the platform G-3 taken by the PASJM 2013

6.2 Process

The first step of my project was to take the pictures of the *maqueta*. As I've mentioned before, when I was in Lima in December 2013 I was given the opportunity to take pictures of the different *maquetas*. To do that work, I put the *maquetas* on a table and took pictures all around them. The pictures of the structures of San Ildefonso were taken by the PASJM with a drone. The camera was set to take pictures every one or two seconds while the drone was flying over the site for approximately 10 minutes.

Then I had to choose the *maqueta* corresponding to the ceremonial site. From the descriptions made in the excavation reports from the PASJM, I knew that the ceremonial structures that could have a correspondence with the *maqueta* were located in the North sector of the site. So

I went through the pictures from the campaign acquisition made with the drone in 2013 from this sector to look for the ceremonial structures that could correspond with the *maquetas* I had chosen previously. Then I created the models of both the *maquetas* and the ceremonial structures of San Ildefonso. I used image-based 3D modeling as a method. It consists in taking a certain number of pictures of an object (here the *maqueta)* or of a feature (here the ceremonial structures of San Ildefonso) from all faces to make a realistic 3D model. In the case of San Ildefonso, the pictures used were taken with a drone. I made separate models of each structure from San Ildefonso and of the *maquetas.* To have a better result, I worked only with the pictures representing the ceremonial structures I was interested in. This means that I wouldn't use the whole landscape of the site. The pictures that I've used to make the 3D model of the *maqueta* were taken without the roof. This is due to the fact that the roof has broken apart from the *maqueta* and even though some restorations have been done on the *maqueta* the roof still stands separately from it. In these conditions it was impossible to make 3D model showing the roof. Besides, the roof was never a feature I planned to compare as the ceremonial structures of San Ildefonso do not present a roof anymore if they ever had one. I, therefore, made the decision to take pictures of the *maqueta* without a roof. To make the models I used the software "Agisoft PhotoScan". I processed the models in high quality and with a texture size of 4096 x 6 to differentiate more details (fig.10).

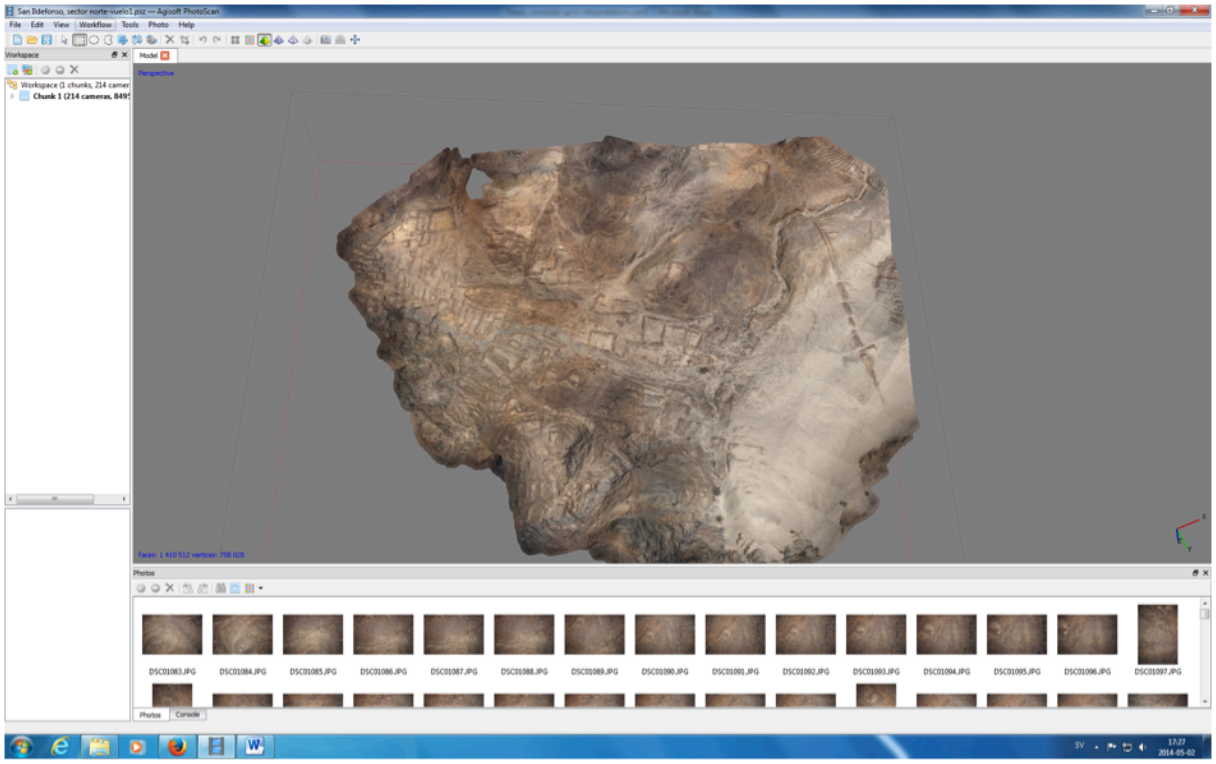

Figure 10: Screenshot taken of the mesh of the sector north of San Ildefonso in "PhotoScan"

I cleaned the models using the software “Meshlab”. Once that step was done, I realized that I had not taken sufficient pictures of the *maquetas,* which as a consequence led to holes in the models. So I decided to reconstruct the missing parts on the models with the software “Autodesk 3ds max 2012”. This step wasn’t planned when I started my work but as the goal of my project is to use digital technologies in a comparative analysis, it seemed better to me to reconstruct the model so it would have the same aspect as the *maqueta* itself. If I would have had access to the *maquetas* while I was working on my project, I would have made the decision to retake pictures and reprocess the model, but unfortunately it was impossible as I am currently studying in Sweden and the *maquetas* are located in Peru.

The following step was to scale the models. I first scaled the model of the structure G-3 to its real size. I used the measurements that the PASJM took during the field season 2009 that can be found in *Informe Temporada 2009* produced by the project. I then scaled the 3D model of the *maqueta* 01 to the size of the structure G-3 with the software “Meshlab”. One of the many tools of this software is a ruler. I measured one of the walls and I divided the real measurement by the virtual one- being the measurement on the 3D model. This result could then be used in the “Transform: Scale” application within “Meshlab” which gave me a scaled model (fig.11). The same process was used to scale the *maqueta* to the ceremonial structure’s size.

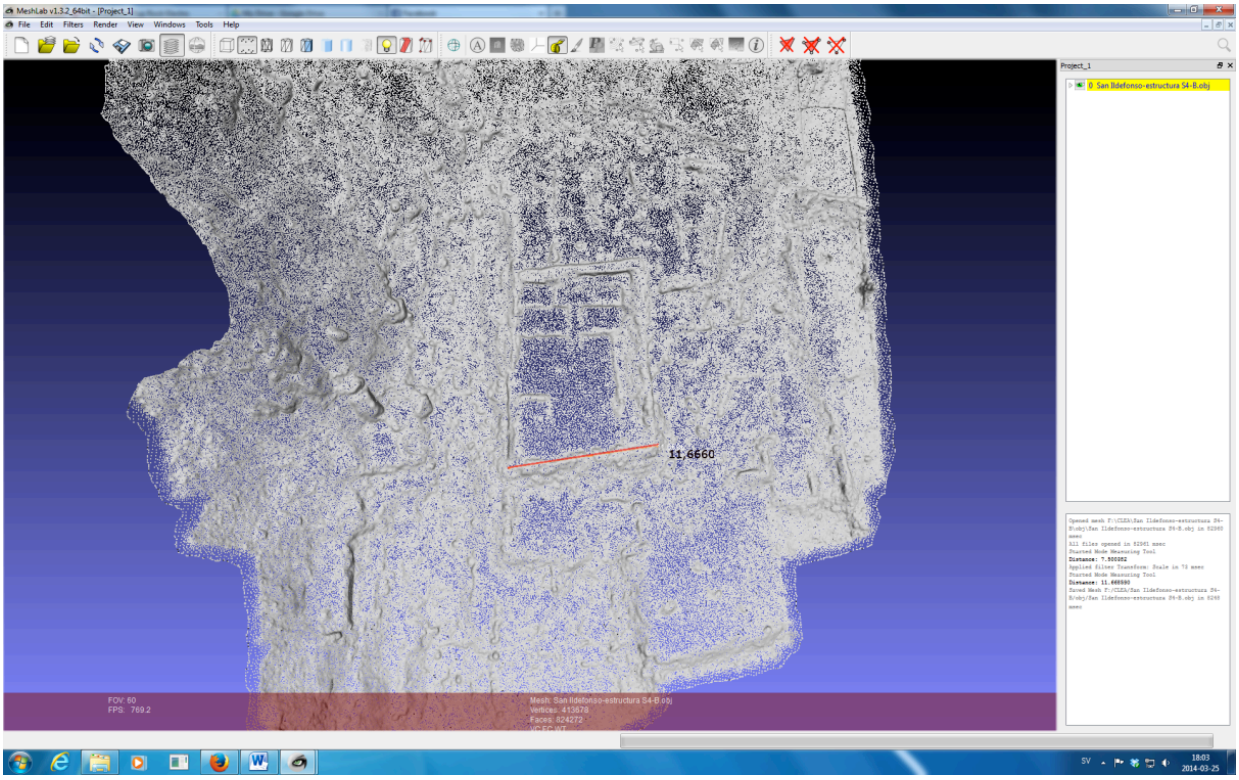

Figure 11: Screenshot taken during the process of scaling in “Meshlab”

The next part of my work consisted in aligning the two models together to see if the common features would fit. I worked with the software “Autodesk 3ds max 2012” (fig. 12). I imported both models into this software. Among the tools provided by the software, there are two tools that allow the user to move and rotate one selected object. Using these tools I placed the model of the *maqueta* directly on top of the model of the structure. This step was the most important of my work, as it would allow me to draw conclusions about my method and the significance of the *maquetas.*

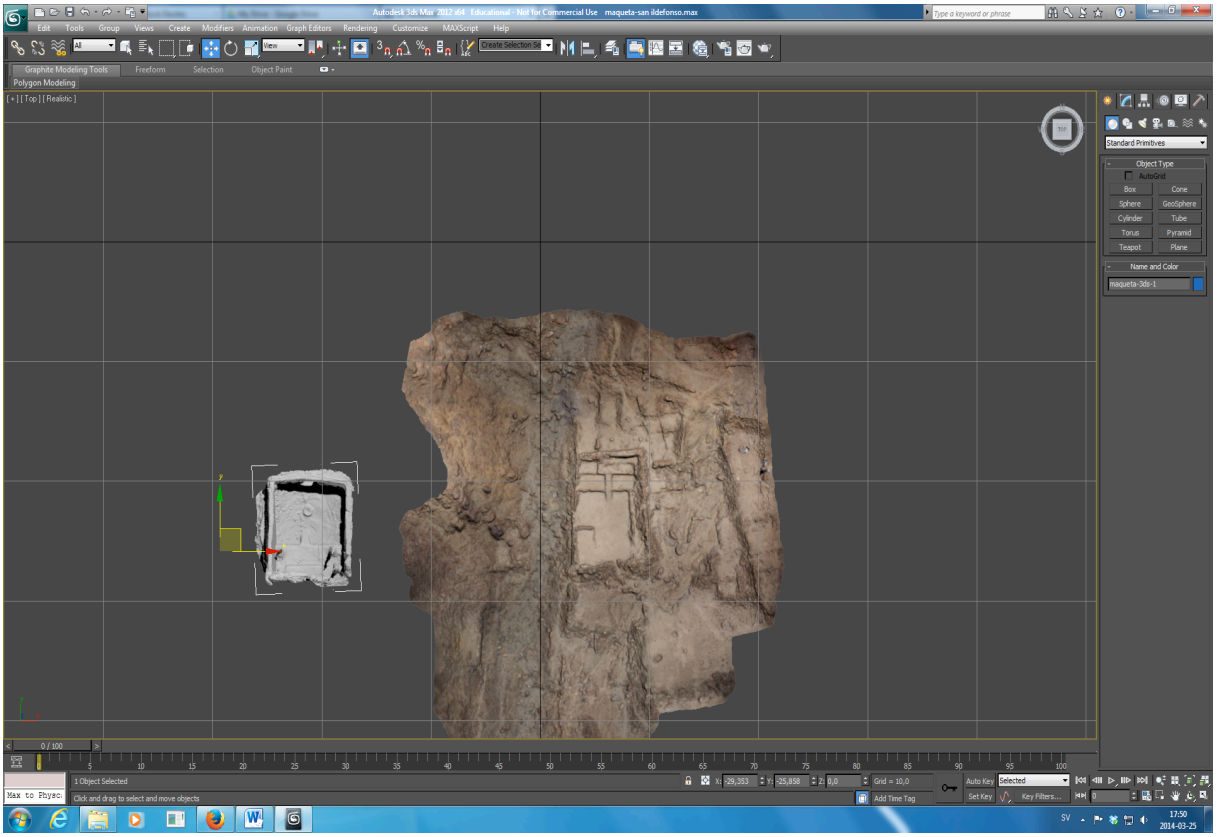

Figure 12: Screenshot taken during the process of aligning the 3D models to see the similarities in "Autodesk 3ds max 2012"

6.3 Results

Before presenting my results that will focus on the comparison of the different similar and dissimilar features in both models, I will give a brief description of the *maqueta* and the structure G-3.

The *maqueta* is a closed structure of a rectangular form. Its dimensions are 19,4 cm in length, 17,7 cm in width and 16 cm high (including the roof). It only has one entrance and two lateral benches that can be accessed by a ramp. It also had a roof that for some technical reasons (conservation issues) couldn't be included in the 3D model (fig.13). However, it is possible to notice on the 3D model the presence of the columns that supported the roof. In the patio we can see a round feature that has been interpreted as the base of a ceramic jar (Castillo et al., 2012: 132).

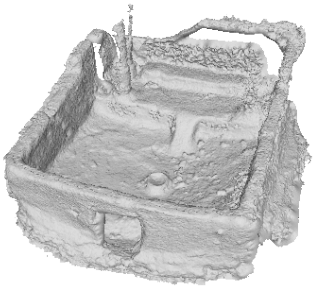

Figure 13: snapshot of the 3D model of the *maqueta*

The platform G-3 is a closed structure of 14 m length and 11,8 m wide (fig.14). It is a rectangular structure with walls that are 0,90 m wide and 1,10 m high (Cusicanqui, 2009: 64). The entrance to the structure is located on the western wall. In the patio on the north western side is located a square chamber and on the south side of the patio there is a bench. There are two lateral benches on the eastern part of the structure. On top of the last bench, there is a dais.

Figure 14: Snapshot of the 3D model of the structure G-3

The final result of my work was quite surprising to me in the sense that even though I knew from the previous research that the *maquetas* were highly similar to actual structures, I never thought that the main features from the 3D models would fit almost perfectly (figure 15 & 16).

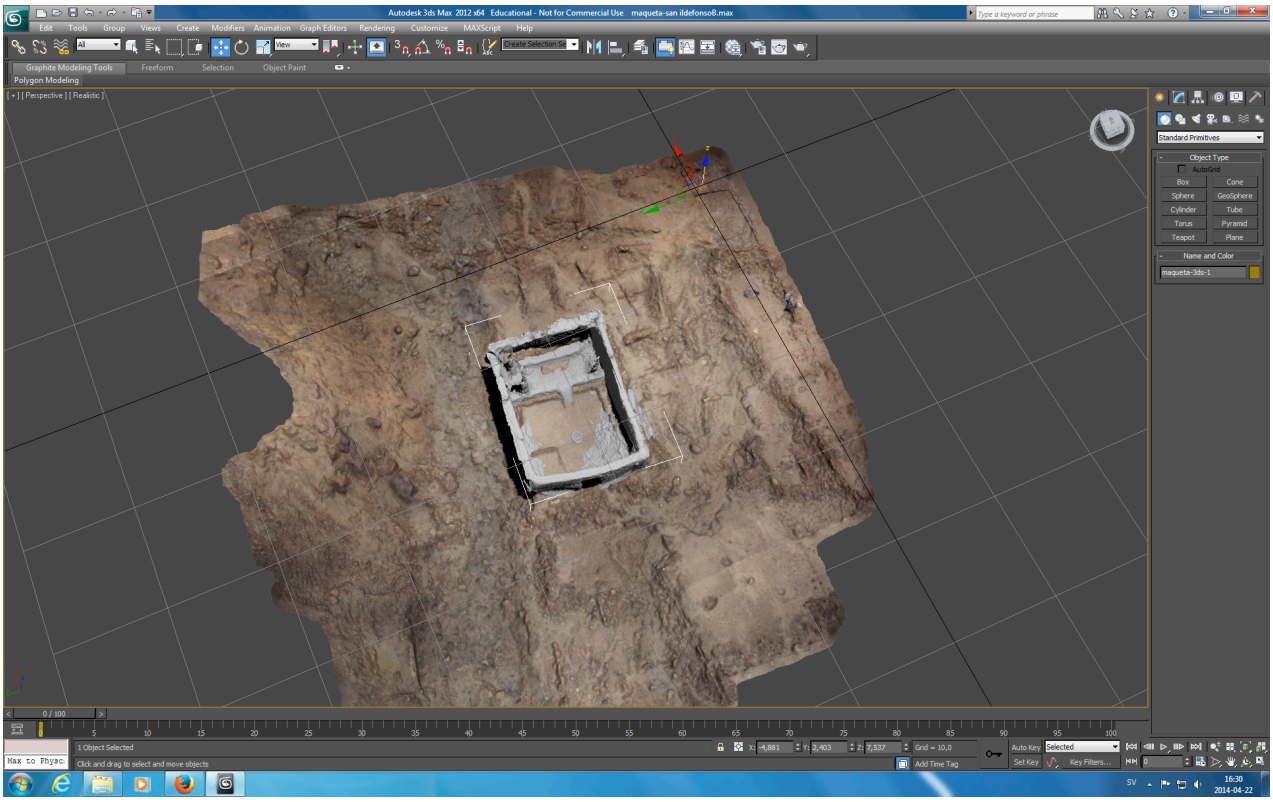

Figure 15: Screenshot of the general view of the placement of the *maqueta* 01 on the platform G-3

Figure 16: Screenshot of a detail view of the placement of the maqueta on the platform G-3

However differences and similarities between them can be noticed. I will first expose the similarities that can be seen. The ramp of the 3D model of the *maqueta* fits almost perfectly with the ramp of the 3D model of the platform G-3. The same can be noticed with the two lateral benches as well as the perimeter walls. Finally, the dais is difficult to notice on both 3D models.

The differences appear to be between the smaller features. The first one is the presence of four columns on the 3D model of the *maqueta* and a lack of its presence on the 3D model of the structure. In the structure G-3 a small bench is present in the patio but there is no trace of it on the *maqueta.* Nonetheless, a few hypotheses can be drawn about these differences. It is highly plausible that the platform G-3 presented a roof that would have probably been made of wood. This material, being perishable and therefore not found at the site, easily explains why no traces of it can be seen on the 3D model of the structure. As for the bench present in the structure and not the *maqueta*, one explanation could be that the bench was built after *maqueta.* Another explanation could be that the people that made the *maqueta* didn't judge it as important as the others features to represent it.

7. Discussion

Here, I will discuss my method and how I find it constructive for my analysis. I will also discuss the significance of the *maquetas*: determine if they were representation of actual buildings, if they were architectural prototypes or if they were symbolic and ritual objects.

7.1 Image-based 3D modeling, a constructive approach in a comparative analysis?

One of the principal aims of my work was to determine if the use of image-based 3D modeling could be a constructive approach in a comparative analysis. To respond to that purpose I focused my work on one case study and compared the main features of both 3D models of the *maqueta* and the ceremonial structure. In other words I compared the perimeter walls, the dais, the ramps and the benches.

I believe that using image-based 3D models in my comparative analysis was constructive. To me, the possibility to see both the artifacts and the site in 3D helped me in my analysis and interpretation. It was impossible for me to be in Peru during the time I went through the process of my work and therefore it was impossible for me to hold the *maquetas* and see any details of them. The 3D model replaced that need. It was possible for me during the whole process of my work to see the details of the *maquetas* that I needed for my analysis and interpretation. When it comes to the different structures of San Ildefonso, I knew how the *maquetas* looked and I also knew which similarities I was looking for among the structures. It was easier to do that by looking at the 3D models of each sectors of San Ildefonso than by looking at the thousand aerial pictures taken by the PASJM. In fact it is easy to find common features between the *maquetas* and structures of San Ildefonso. The *maquetas* and the structures compared with are more or less all rectangular, with a ramp and some benches but it doesn't necessarily mean that the features are corresponding ones. Placing the *maquetas* on top of the structures helped me to realize almost immediately if they could be the representation of a structure or not. It was easier to notice the general shape of the details in the 3D models.

But this method was more than just being able to look at details of the *maqueta* and a specific architectural structure, with this method I was able to present results that confirmed the assumptions made by different scholars. They made assumptions that the *maquetas* of San

José de Moro represented ceremonial buildings of different sites in the Jequetepeque valley such as Cerro Chépen or San Ildefonso. My approach confirmed their hypotheses. Thanks to my method, I can now affirm -at least for my case study- that the *maqueta* is indeed a representation of a ceremonial structure of San Ildefonso.

Naturally as every method, image-based 3D modeling also has some disadvantages. One of them is the necessity of correctly taking all of the pictures that will be used to make the models. As I've mentioned earlier in my thesis, I didn't take the pictures of the *maquetas* correctly which caused holes to be created in the models. It was then impossible for me then to retake pictures to have a better model as the artifacts were located in another country. Another problem is the cost of the software. I used the educational version of the software "Agisoft Photoscan" as I didn't have the material to georeference the 3D models but if I would have had the data to georeference the 3D models, I would have needed the professional version that is really expensive. It is also time consuming, making the 3D models of structures of San Ildefonso take between 5 to 10 hours depending of the quality chosen for the 3D model.

However, all in all, this method proved to be constructive in a comparative analysis. I believe that this approach could be applied to the comparison of the others *maquetas* from the PASJM and the ceremonial structures of different sites of the Jequetepeque valley.

7.2 *Maquetas* of San José de Moro

In this part of my thesis, I will answer to three different questions. First of all, I will respond to the question of knowing if the *maquetas* are representation of actual buildings. Then I will explain if the *maquetas* could have been architectural prototypes or if they were symbolic and ritual objects.

7.2.1 *Maquetas* as actual buildings ?

My main question during my research was to know if the *maquetas* are representations of actual buildings. My interpretation will be based on the results I have presented earlier. They have shown that the *maqueta* 01 and the ceremonial platform G-3 of San Ildefonso shared similarities for all their main features. An object can be defined as a representation if it

reflects the meaning as it exists in the world (Hall et al., 2013: 10). Based on this definition and the results of my case study, I can conclude that the *maqueta* is a representation, as it represented something that existed in the Moche world. My case study only focused on one *maqueta* and one structure but I think that if the similarities between one structure and one *maqueta* are so important, it is easy to imagine that it is the same between the other *maquetas* from SJM and others structures located in the Jequetepeque valley.

The work conducted by Swenson in San Ildefonso, let him conclude that the architectural structure that I use in my comparison has been interpreted as ceremonial structures built and used by the elite. They were used to perform ritual ceremonies where the priests/priestesses would personify one of the deities from the Mochica pantheon. Following Bourdieu's interpretation of the Kabyle house being the representation of the organization of the Kabyle society, I argue that the ceremonial structures were representations of the social organization of the Moche society and the materialization of its ideology. Therefore as the *maquetas* are representations of the ceremonial structures, interpreted as used by the priestesses, the *maquetas* reflected the Moche society and its social organization and beliefs.

7.2.2 *Maquetas* as architectural prototypes?

As previously mentioned, the results of my work demonstrated that the main features of both the platform G-3 and the *maqueta* 01 were similar and it makes me highly certain that the *maqueta* was a representation of a type of building existing in the real world. One of my main interests before starting this work was why these artifacts were put as offerings in the tombs. One of the hypotheses is that it could have been used as a model by an architect before building a construction. If so, they would have been used as prototypes, the Incas for example used such prototypes for their construction (Protzen, 2011: 88-89). From the chronicles written during the 16th and 17th centuries by the Spaniards, we know for example that the Inca Pachacútec ordered *maquetas* of buildings he was planning to build in Cusco to help him make decisions about the constructions (Protzen, 2011: 88).

It is possible that the Mochicas did the same thing and therefore placed the *maquetas* in the burial of the person who funded or designed the building of the structure. But it seems most unlikely in my case study that the *maquetas* were prototypes and used as the same way as the

Incas. First, the architects that I've worked with *maquetas,* considered them as idealized copies of specific buildings (Canziani, 2011: 29; Protzen, 2011: 87). Second, the archaeologists that excavated the tomb M-U1525 where the *maqueta* was found, interpreted the main individual as a priestess. I do not believe that the *maqueta* had been placed in her tomb because she designed the building. I would agree Canziani and Protzen's interpretations about *maquetas* being most likely idealized copy of specific buildings.

7.2.3 *Maquetas* as symbolic and ritual objects?

The principal individual in the tomb M-U1525, where the *maquetas* were found, was interpreted as a "priestess", a high rank individual in the Mochica society and probably one of the highest in the Jequetepeque valley. To understand completely the *maquetas,* I believe that it is important to understand their meaning: were they symbolic and ritual objects as they are representations of actual buildings but not architectural prototypes.

It seems meaningful to refer to other examples taken outside of a pre-Colombian culture to understand the meaning of the *maquetas,* as most of the known *maquetas* from the pre-Hispanic cultures were unfortunately the result of looting and therefore do not have an archaeological context to fully understand them. Others cultures have produced models found in burials, such as the Egyptians or the Han dynasty in China. During the Middle Kingdom (ca 2050-1650 BC) in Egypt, burials could contain wooden models or above the burials "soul-house" models were uncovered (Grinsell, 1975: 54). The most preserved one was found in the tomb of Meket-Re in Thebes and inside the model there are statuette servants grinding grains, making food… (fig.17) These models are believed to be a symbolic representation of the everyday life and were placed in burials as "symbolic of the continuation in the hereafter of the activities of this life" (Grinsell, 1975: 54). This interpretation seems meaningful for my own interpretation of the *maquetas.*

Figure 17: Granary model from Meket-Re tomb (http://www.metmuseum.org/collections/search-the-collections/545281)

I do believe that the *maquetas* were grave goods placed in the burials for their symbolic significance to the afterlife. Before going further on this topic, I think that it is important to mention, here, the place of burial rituals in the Andean world and the burial rites of the Moche society. The Andean cultures had an animistic and polytheistic religion. They viewed the world around them as sacred and spiritually animated (Swenson, 2004: 186) and linked to their ancestors and the dead. Rituals were extremely important in the Andean world and we know from the iconography that the Moche religion and society performed an important number of ritual acts. Donnan and McClelland name the different rituals as themes- they have been interpreted as (Donnan & McClelland, 1979: 4), and burial is one of these themes. It is thought to be one of the most important activities in the Moche world, probably because giving a burial to the dead was a restoration of order or equilibrium in the world (Hocquenghem, 1980; Wiersema, 2010: 214). Additionally, grave goods were placed in the burials to please the deceased and keep him from "wandering the earth hungry, thirsty and tired" (Wiersema, 2010: 217). In the depiction of the Burial Theme that has been found on stirrup spout bottles of the Late Moche style, one can notice the presence of grave goods that can accordingly be found in the Moche burials. Castillo says that the Moche recreated the

ceremonial identity and the social position of the person that was buried in the tomb (Castillo, 2000: 29). Some of the artifacts were probably used during ceremonies and therefore reproduced the identity of the "priestess" and are indicators of the functions she occupied during her life (Castillo, 2005: 10). The choice of placing grave goods and sacrificed humans and animals to accompany the dead is clearly a ritual act. Bell defines ritual acts as powerful and significant (Bell, 1992: 90). Berggren and Nillsson Stutz mentioned in their work how ritual practices structured lives of people (Berggren and Nillsson Stutz, 2010). The Mochicas of the Jequepeteque valley were peregrinating to San José de Moro on special occasions to bury their dead. I believe that was a powerful act that structured the Moche's lives. The *maquetas* were objects placed as grave goods and therefore were part of the ritual act, which I think makes them ritual objects as they were part of a ritual practice.

As I said before, I believe that the *maquetas* are objects with a symbolic and ritual meaning, I will now explain why. First, I should remind that ceremonial architecture had an important place in the Moche religion and society (Swenson 2004, Wiersema 2010). It seems meaningful at this point to give a better description of both the "priestesses" and the site of San Ildefonso. As I've previously mentioned, chamber burials belonging to females' elite of the Mochica society have been uncovered in San José de Moro. They've been interpreted as "priestesses" because of the artifacts that accompanied them in the burial. They were found in a coffin that usually had metal objects in form of arms and legs, with a funerary mask, copper feathers, ceremonial headdresses and a copper cup. Sacrificed individuals also accompanied them. The copper cup had a lot of similarities with the cup depicted in the Sacrifice Ceremony on Moche ceramics and used by an anthropomorphic female supernatural. Also the sacrificed individuals are interpreted as the entourage of the "priestess" during funerary ceremonies that are depicted on the Burial Theme (Castillo, 2005).

San Ildefonso is located on the western side of the Cerro de San Ildefonso, in the desert zone adjacent to the mouth of the Chamán River, west of San José de Moro (fig.2). It was a settlement with defensive walls but no "clear-out-craft-production areas" (Swenson, 2004: 414). The site is composed of many platforms but none of them seem to have mortuary functions (Ibid). This is important to note, as it is often that burials have been found in platform structures in different Moche sites such as Pacatnamú and Huaca de la Luna. This was due to the fact that these platforms were loci of religious rituals and honoring the ancestors was one of the many rituals performed in the Mochica society and religion. In the

platforms of San Ildefonso, some artifacts used during rituals have been uncovered. This in association with the multi-terraced platform structures with ramps and daises enhance the importance of rituals in San Ildefonso (Swenson, 2004: 425). Swenson interprets the platforms as built to "stage and accentuate 'performance' which was intended to be visible to audiences of variable size" (Swenson, 2004: 433). I mentioned above in my research, it is important to link both archaeology and iconography. Swenson has uncovered during his work signs of rituals in the platforms in San Ildefonso and the iconography can confirm the importance of these structures during rituals (fig.18&19).

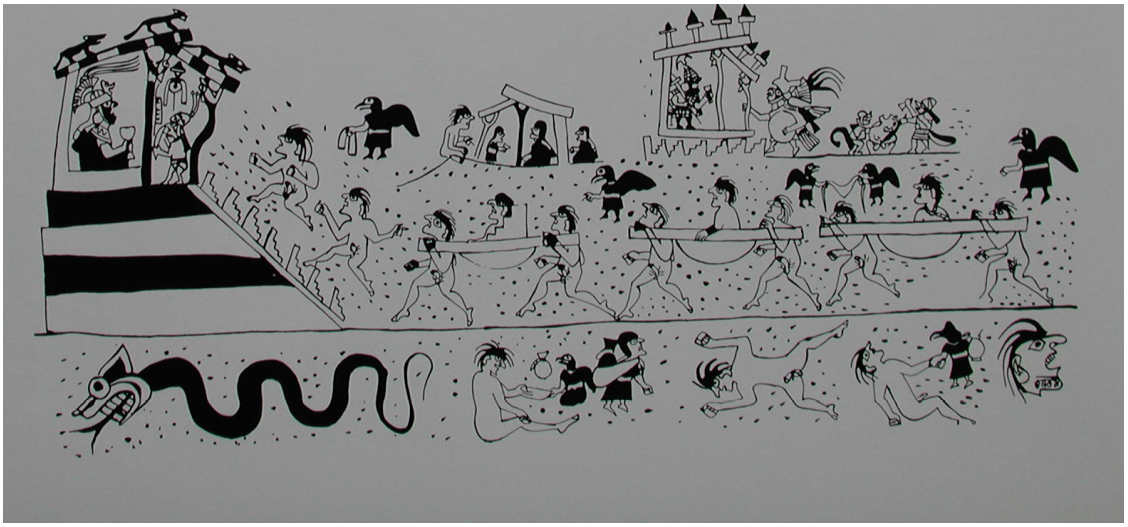

Figure 18: Sacrifice Theme: on the left a deity stands on a dais and the sacrificed individuals are brought to him through the ramp (Adapted from Donnan & McClelland 1999 figure 4.48)

Figure 19: in the middle the deity stands on a dais and is given a cup by an individual standing on the ramp (adapted from Hocquenghem 1989 figura 2c)

In all these depictions we can observe one of the deities from the Moche pantheon performing some ritual ceremonies. The deity stands on a platform with ramp and dais. In the depiction of the Presentation Theme, a woman has been identified by Hocquenchem and Lyon (1980). The discovery in San José de Moro of "priestesses'" tombs with artifacts such as cups and headdresses also depicted on the ceramics confirmed their interpretation. Even though the individuals represented on the platforms seem to be male figures only, the fact that platforms with ramps and daises are depicted in rituals themes proved the importance these structures must have had in the Moche society. Furthermore, the depiction of female figures in only some themes doesn't mean that in the real life female individuals didn't perform rituals on these platforms with ramps and daises.

In many others cultures, grave goods have been interpreted as objects accompanying the deceased to the afterlife so the dead could find all that he/she could need to live in peace in his/her other life and reproduce the life he/she had before passing away. I believe that it was most likely the same for the Mochicas. I consider that this "priestess" was most likely related to the platform G-3. As I mentioned earlier, no one was buried in the platforms of San Ildefonso. The *maqueta* 01 could therefore be an object placed in this burial to replace the platform G-3 that obviously couldn't be placed in a burial in San José de Moro. All the grave goods as well as the sacrificed individuals and animals were most likely placed in the burial so the "priestess" would be able to have a similar life in the afterlife to the one she had on earth.

Following this reasoning, I would say that the 7 others *maquetas* placed in the tomb were also representations of buildings that they were related to the priestess. As my work only focused on one *maqueta,* it is hard to know if they could be representations of buildings in the same sector. Although, I do think, for example, that the *maqueta* 01 found in the niche 01 of the burial M-U1525 (fig.20), could be one of the constructions of the sector G.

Figure 20: *maqueta* 01 from the niche 01 (photo: Cléa Moulin).

This *maqueta* can also represent a platform such as the platform G-3. The *maqueta* also has terraces that can be accessed by ramps with a dais. It can either represent the same platform or it can also represent a structure with some similar features in others parts of San Ildefonso as Swenson recorded 18 different structures with ramps (Swenson, 2004: 448). It can also be the representation of a platform located in another site in the Jequetepeque valley. We know for a fact that people, coming from different sites in the Jequetepeque valley, performed processions and feasts every year in San José de Moro. As I've mentioned before, the site was an important ceremonial center that was occupied by various cultures (Moche, Transitional, Lambayeque, Chimú and Inca) and is the only large-scale cemetery found in the Jequetepeque valley where the elite burials (chamber burials) mostly contained females. The population of the valley was peregrinating there for special rituals. It seems plausible that the "priestess" could have been related to others sites in the valley and could have performed there as well during special occasions.

In my case study I used the structure G-3, which is considered a platform with ramps and a dais. However, the size of its terraces made Swenson think that they could only be used by a

small number of individuals (Swenson, 2004: 490). His interpretation is based on the fact that the others structures in the sector G are constructions with patio and chambers which lead him to interpret it as a sector that could have served as residence for high status members of the society (Swenson, 2004: 490). The *maqueta* 01 was most likely the representation of the platform G-3 and we know that it was found on a "priestess" tomb. That associated with Swenson's interpretation of the sector G, it appears to me that the "priestess" could have lived in this sector and could have conducted some rituals in this platform. Rituals that could have been performed only with and for a small number of individuals in the society, most likely the high status members of the sector G.

To summarize, I believe that the *maquetas* are representation of monuments existing in the real Moche world and are the materialization of the social organization of the Moche society. In my case study, I believe it to be the representation of a ceremonial platform structure. By explaining the importance of the ceremonial structures for rituals in the Late Moche Period in the Jequetepeque Valley and showing how the "priestess" could be linked to these structures, I tried to prove the importance of the elite in the social and political organization of the Mochicas. I also tried to demonstrate that placing *maquetas* in a burial gives the object a ritual significance, as by nature a burials is a religious and ritual event and all grave goods are ritual objects by extension. It obviously also carries a symbolic meaning: the objects placed in the tombs, I believe, were carefully chosen because they had a meaning for the deceased. Placing a representation of a ceremonial structure where the priestess could have performed rituals is a way of showing her high status and power and to reproduce it in the afterlife.

8. Conclusions

In this work I argued how constructive image-based 3D modeling could be in a comparative analysis. My final goals were first to be able to get a better understanding of the *maquetas* and their connection with the ceremonial structures of San Ildefonso and, by extension, of others sites of the Jequetepeque valley and second, to interpret the significance of these peculiar artifacts.

Image-based 3D modeling was a constructive approach in my project. I discussed how this method brought new results to the study of the *maquetas* and confirmed assumptions made previously about the *maquetas* being representations of ceremonial buildings of different sites in the Jequetepeque valley. The results were easily obtained. It was fast to realize if the *maqueta* could correspond to a specific structure or not. Of course, as every method, this approach presented some disadvantages such as making the 3D models is time consuming; the pictures need to be taken well to be able to make a good 3D model. I believe that my work helped to better understand the *maquetas* and their link to the ceremonial structures located in different hinterland sites in the Jequetepeque Valley.

I argued that the *maquetas* of San José de Moro are representations of buildings existing the real Moche world. I argued that they were idealized representations of buildings and therefore were not architectural prototypes. I discussed how they were the materialization of the social organization of the Moche society. I argued about the importance of the ceremonial structures in the Jequetepeque Valley and demonstrated the link between the "priestess" and the structures. They were ritual objects as they were placed in burials among other grave goods and burials are the results of ritual acts but they were also symbolic objects as they were carefully chosen for the meaning they had for the dead to reproduce the identity and status of the person in the afterlife.

The *maquetas* found in San José de Moro were only found in the burials of individuals interpreted as "priestesses" but they are not the only *maquetas* of the Mochica period. In fact, some private collections have *maquetas* interpreted as pertaining to the Mochica culture but their archaeological context is unknown which makes them extremely difficult to interpret. It would be interesting nonetheless to try to apply this method and see what conclusions could be drawn from it. This approach could also be applied to others *maquetas* from the Andean cultures (Nazca, Chimú, Inca). For example in Huaca de la Luna, some Chimú *maquetas* were grave goods found during excavations. The archaeologists established parallels between these *maquetas* and the form and design of squares in the palaces in Chan Chan (Uceda, 2011). This approach could help to confirm the hypotheses made by the archaeologists that uncovered these *maquetas.*

To summarize, I believe that using image-based 3D modeling as a method in a comparative analysis was constructive. I think that this method should be applied to all the *maquetas* of

San José de Moro to compare them with the structures of the different sites of the Jequetepeque valley. It would, I believe, help to get a better understanding of the social and political organization in the Jequetepeque Valley during the Late Moche period, in particular the role of the female elite in this valley as it appears to be particular to the Jequetepeque Valley. To go further on this matter, virtual reconstructions of the structures based on the *maquetas* could be done.

9. Summary

My goals when I started this work were first to demonstrate how constructive an image-based 3D modeling approach can be in a comparative analysis and second to better understand the significance of the *maquetas* that are peculiar and rare objects in the Moche world.

My work focused on comparing a ceremonial structure of San Ildefonso and a *maqueta* from San José de Moro. My results and interpretations came from the 3D models I made. The possibility of employing such an approach proved to be constructive in my analysis as I needed to be able to move the objects and look closer at them. I would have been unable to do so with only pictures in my possession. It also proved to be a constructive approach as I managed to easily draw results from it.

From my results I was able to interpret the significance of the *maquetas*. These objects were, in my opinion, representation of structures from the real world. They were placed in burials among other grave goods because they were linked to the principal individual of the tomb. This individual, being a "priestess" and the *maqueta* being the representation of a ceremonial structure, it is easy to understand the link between the artifact and the "priestess". I argued that if one of the *maquetas* was linked to the main individual of the tomb, the others are also probably linked to her. Moreover, I discussed how these objects are symbolic and ritual objects that support the Mochica ideology.

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