THE TRADE AND EXCHANGE OF OBSIDIAN IN THE BASIN OF MEXICO DURING THE CLASSIC PERIOD

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A Thesis

Presented to

The Faculty of the Department

of Anthropology

University of Houston

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In Partial Fulfillment

Of the Requirements for the Degree of

Master of Arts

_____

By

Sergio Elizarraga Oregel

August, 2017

THE TRADE AND EXCHANGE OF OBSIDIAN IN THE BASIN OF MEXICO DURING THE CLASSIC PERIOD

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ABSTRACT

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This thesis details the trade and exchange of Pachuca obsidian in the Basin of Mexico, focusing on the Teotihuacan Valley region, during the Classic Period by incorporating two intraregional models for Teotihuacan economy of Pachuca obsidian with both its urban and rural areas. The Tlajinga district is the focus of the urban area and the Teotihuacan Valley for the rural area, looking at the trade and exchange pattern between these two different areas and the interactions they had with Teotihuacan. Looking at Pachuca prismatic blades and obsidian cores emphasizes the importance of this obsidian in this region in its economic and symbolic value. The symbolic value comes from the obsidian blades imagery that are found in Teotihuacan that show obsidian as more than a utilitarian tool.

ACKNOWLEDGEMENTS

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To my mom and dad, for the love and support they gave me and encouragement to further continue my higher education. Words alone cannot describe everything they have done for my little brothers and me. With my brothers constant teasing and support, this is just you guys trying to get back for me being an older brother and I know each one of will do great things. To my friends, fellow students, and support group, I want to say thank you. Each one helped in this journey. To Cassidy, the inspiration you give me to continue my education and

goals I set myself, the dedication you give me to push forward through difficult times, and the admiration we have for each other to continue our best. Without you, I do not think I would here in this part of my life and I just want to say is thank you. I am going continue to push myself, both physically and mentally as long as you are someone I can stand next to.

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Chapter 1: Introduction

Introduction:

The thesis work that I am presenting is the trade and exchange of the Sierra de las Navajas obsidian or commonly known as Pachuca obsidian in the Basin of Mexico during the Classic period (300 BCE-900 BCE). The Sierra de las Navajas obsidian will be called Pachuca obsidian for the remainder of this thesis. The focus of the trade network is on an intraregional model (inside its own region) instead of an interregional model (outside its own region) which was the focus of many model approaches for Teotihuacan. There has been extensive archaeological work throughout time focusing on trade and exchange ideas with new theories and methodology emerging thanks to the decades of extensive anthropological/archaeological works in Mesoamerica. The trade and exchange theory forms the theoretical framework behind my thesis topic and will be incorporate into answering the questions for this thesis. The theoretical idea of trade and exchange is the movement of resources from one location to another location and the interaction between each set of people from said location. A clearer definition of trade and exchange comes from Renfrew (1977) and Polanyi (1975). Renfrew definition: "Trade in this case implies procurement of materials from a distance, by whatever mechanism" (Renfrew, 1977:72). Polanyi definition: "Trade is a method of acquiring goods that are not available on the spot" (Polanyi, 1975: 133-134). The focus of the trade network is looking at how patterns are established between groups for an intraregional system between large city-states and smaller communities by using known previous models of exchange systems. Inputting an intraregional model for the Basin of Mexico and using Pachuca Obsidian that is in the archaeological records, it can show the influence of large-city state, like Teotihuacan, on rural communities in the Basin of Mexico.

The focus of the intraregional model will be on the Pachuca obsidian and seeing the different stages of obsidian production: raw (unworked), macrocore (semi-worked), polyhedral core (semi-worked), and finished products: prismatic blades, lancets, bifaces, unifaces, and hafted bifaces. The reasons for Pachuca obsidian being the center of the thesis is that the material is easily recognizable in the archeological record, has glass physical properties making its nature of reduction technology makes it easy to form and shaped, and there are vast amounts of written articles (Nelson and Clark, 1990). Pachuca obsidian is one of the most well-known and studied lithic materials in Mesoamerica, and the important views it had on major centers like Teotihuacan. Focusing more on the intraregional model will show the social interaction people had between Teotihuacan and rural communities around the large city-state. By looking at Pachuca obsidian, one can possibly understand the production levels that an intraregional trade and exchange network had for finished or semi-finished obsidian artifacts being transported to the location and redistributed in its region. This study will look at previous data reports of obsidian from apartment compounds in Teotihuacan and rural sites in the Teotihuacan Valley. Another focus for the thesis is incorporating iconography and ethnohistory to show the importance of obsidian in Mesoamerican culture, not just as a utilitarian tool, but by adding a symbolic value that is seen in Mesoamerica. I would argue that is was from the Pachuca obsidian source because of the high concentration and focus of obsidian prismatic blades being used primarily from Pachuca obsidian. By looking at Pachuca obsidian tools like prismatic blades, which was used for everyday function like food preparation (cutting meat) and the symbolic function by showing the significant of rituals implements like an individual ritual practicing of autosacrifice to draw blood from themselves to give tribute to the gods. The results of my thesis, I hope to have a better understanding of the socioeconomic state of the Basin of Mexico,

primarily in the Teotihuacan Valley and look at the obsidian material not solely as utilitarian, but look at it with a symbolic value as well.

Economic Anthropology:

Economic Anthropology is a sub-field of anthropology that focuses on human economic behavior in history, geography, and culture. Economic Anthropology saw its start with Malinowski (1920) and Mauss (1922) in their study of the gift-giving in the Polynesian islands. Studying the impact of the economy, social, and political role of gift-giving in the Trobriand Islands located in the east of New Guinea. This is different from political economy, the theoretical idea of Karl Marxist, which focus on production instead of exchange, but was a strong focus in anthropology due to the idea of division of labor (different level of work between individuals) during the 19th and early to mid-20th century. After World War II, Karl Polanyi, an economist historian, brought his theoretical idea of Substantivism, from the culture context involved in economy, which merged culture and economy, instead of separating the two. This brought the debate between Formalist vs. Substantivist thinking, where Polanyi broke down the word economy into its two root forms: substantive and formal (Polanyi, 1957:243). Formalist ideas were based on the utility of maximization under societal pressure and put emphasize in individual choice then the cultural behavior (Polanyi, 1957:243-244). Polanyi's meaning of substantive of economic stems from "man's dependence for his living upon nature and his fellows (Polanyi, 1957: 243). The economic meaning of formal is "the logical character of the means-ends relationship, as apparent in such words as "economical" of "economizing" (Polanyi, 1957: 243). With formalist theoretical ideas favoring much of the basic understanding of economy while substantivism was more favorable to social science like anthropology because it focuses on behavior instead of the basic economic ideas.

George Dalton was one of the first Anthropologists to study the “primitive economies”, and played a large part in the debate Polanyi started. Dalton looked at how ancient economies differed from western economies because many of the theoretical economic ideas are based on western economics (Dalton, 1961). Many of the economic theories needed to be thought differently from the western ideas since many ancient societies did not have a form of currency in a western sense. Without a form of the western idea of currency, how did ancient societies interact with each other when the need of supplies is in demand? With much of the economic theories base on western economics this not fit the sense of primitive economies since it deals with groups of people behaviors and cultural norms instead of individual. Dalton gives several reason on how formal economic theory do not applied to primitive economies.: (1) “The substantive meaning of economic is relevant”, (2) There is different levels of economy with principles of organization, (3) the difference between primitive economy to an industrial market systems with certain technological advances in one then the other form of institution, and (4) the terminology that is used in economic practices do not share similarities between these primitive societies and western economy (Dalton, 1961: 20). It shows that when it comes to talking about economic values in anthropology there is a line between our own economic values and the values of the ancient civilization. The idea is not far off from what many archaeologists have done in Mesoamerica since the area had many large civilizations, with not only understanding the basic economic value, but adding the humanistic approach to the greater role of the society. Mesoamerica is a prime example to look at the start of economic function, because certain areas had large dense population while other areas had small spread-out population.

Trade and Exchange:

The two factors of trade and exchange that archaeologists try to answer are: (1) a recognition of exchange as central to maintenance and change in cultural systems, (2) the technological innovations permitting detailed quantitative studies of exchange (Earle & Ericson, 1977:1). In seeing the changes of economic systems through the archaeological records, one can see if changes were made to better drive the economy when factors like population pressure and scarcity of supplies happened. In areas with large population and acquisition of certain material would need a form of exchange or trade to sustain the population. This is especially true in areas of the Basin of Mexico with a population that reached 250,000 during the Classic period (300-750 CE). Certain areas had small windows of precipitation/frost to grow maize, this was the case for Teotihuacan since its location was in the northern section of the basin (Sanders et al., 1979). In Mesoamerica, there are large number of city-states and small rural communities that would need interaction and movement of resources, either as commodities or for utility purposes. By trading and exchanging resources, societies would reinforce individuals on a mutual dependency relationship that is necessary for survival (Hirth, 1984:1). In understanding the trade and exchange network in the Basin of Mexico, we can picture the relationship many of the communities had within its own regional border and their interaction with other groups.

We know the Basin of Mexico is an ideal area for human occupation because of the different kind of resources that are present, the different types of environments, and the amount of people living in the area during the Formative, Classic and Post-Classic periods. This makes it a prime location to see the evolution of complex society through different periods and how economic values contributed to large societies in the Basin of Mexico. Teotihuacan has been the focus of many economic ideas from simple intraregional models to empires. This has been one of

the debates for Teotihuacan on whether the site had control over the Pachuca obsidian source or the city-state taxed its inhabitants of the material. Archaeologists still debate over the economic role Teotihuacan had in the Basin of Mexico, and overall in Mesoamerica because only portion of the city has been excavated. The population for an urban center is a factor to sustainability for any duration, and the city-state would first need to establish its own inhabitant's livelihood. During the height of Teotihuacan, it had a max population of roughly 125,000 people (Cowgill, 2015). With a large population in and around Teotihuacan an exchange network is needed for basic resources to flow in and out for people consumption.

For the Basin of Mexico to have a trade and exchange network it would need an important asset. This asset is people, because people are the ones who would need and would use the material being traded. The study of human population is call demography. The population is important to know because knowing how many people were born, grew, and died in the Basin of Mexico will give us a grasp of the amount of resources needed for survival. Anthropological demographic data should be looked at for trade and exchange in the large-scale survey of the Basin conducted in the 60's and 70's (Sanders et. al., 1979). With having this information of the population, you can see where and how many people lived in certain areas of the Basin of Mexico. This can help with the idea of how much obsidian was being consumed at the different sites in the Basin of Mexico.

Archaeologists have tried to understand the economic studies of ancient societies through the archaeological record. This presents a challenge due to the limitation of the archaeological record since organic material easily deteriorates compared to inorganic material. This is no different for Teotihuacan since organic material like cloth, feathers, and other organic material were traded, but due to decomposition, are rarely preserved in the archaeological record, it is

difficult to know how much was being consumed. Even these materials are found in scarcity, but does not mean it was not widely used in Teotihuacan. In knowing the location of the materials and the knowledge of people living in the area, one can see the relationship and growth of the complex societies into urban centers. In continuing the work that has been done in the area there is some idea on how each of the sites might had a relationship with each other, especially with Teotihuacan.

Intraregional Model:

The focus of the thesis is the socioeconomic studies in the Basin of Mexico intraregional trade and exchange models and domestic economy by introducing two models that will be used for this thesis. With focusing on the interaction between Teotihuacan and the small rural communities around the city. The first model that is presented is Randolph J. Widmer's model of exchange in Teotihuacan is based on the local exchange system that has seven nodes in its trade of foreign commodities (Figure 1.1). The commodity Widmer analyzed for the intraregional model was focus on a species of Pacific marine shell, *Spondylus sp.* which marine shells are found in Teotihuacan and was used for decoration. (Widmer, 1996).

In Widmer's model, the first node will represent the source (origin of the material) in this case it was the Pacific coast. The second node is where the bulk of the material would be held for large trans-shipment to Teotihuacan (Widmer, 1996:275). Node three is located at the edge of Teotihuacan and was used for holding both raw and worked material where the material could be distributed into Teotihuacan market system (Widmer, 1996:275). The fourth node function in the model is a site or location in the market for proper selling of raw material (Widmer, 1996: 275). The fifth node is the craft shop, the sixth node is the vendors, and the seventh node is the material bought for the residential compounds (Widmer, 1996:275). The first three nodes

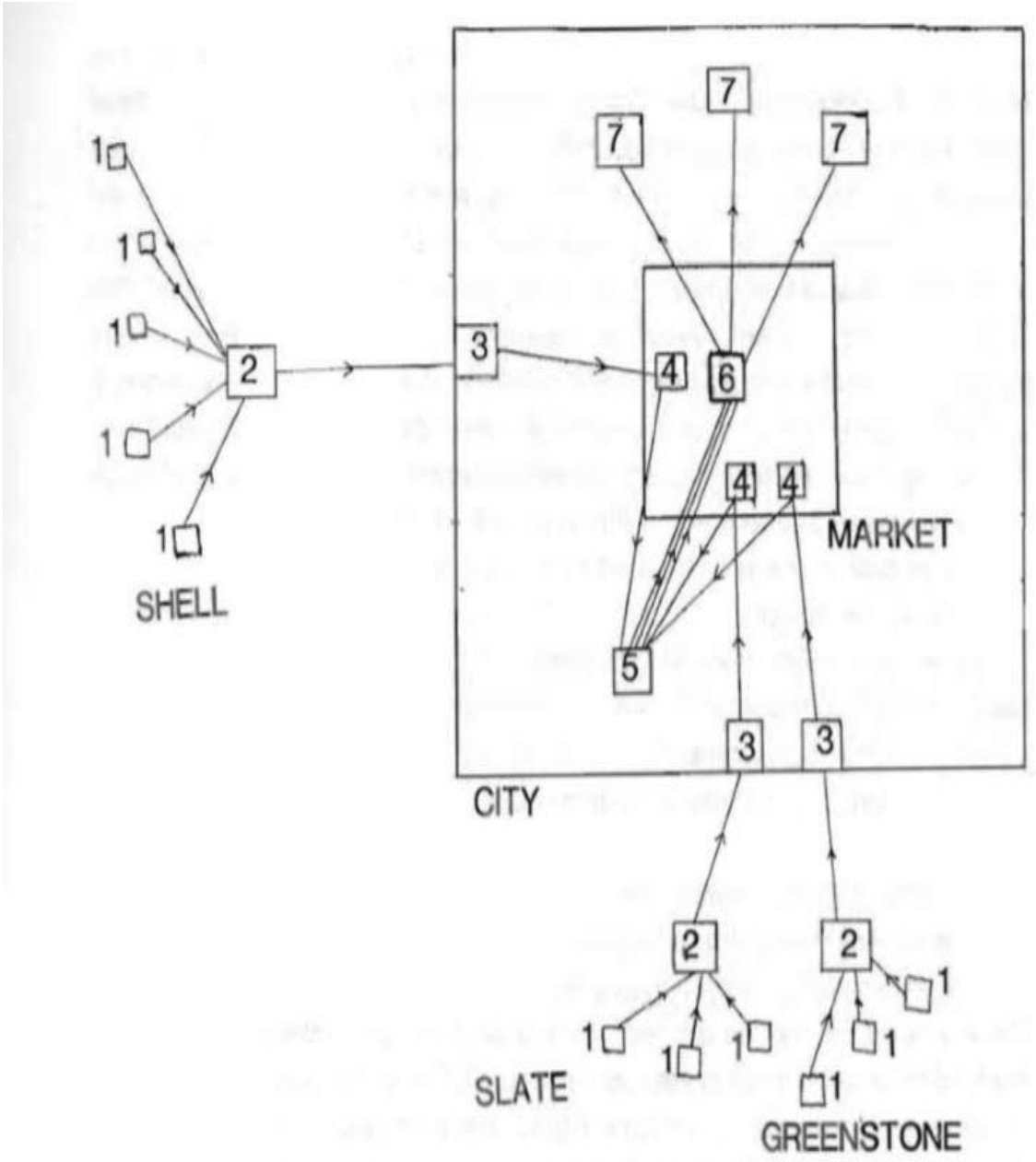

Figure 1.1 Intraregional Map of Pacific marine shell and other material (from Widmer, 1996:275)

are represented as to collect, centralize, and bring single commodity; whereas the rest of the four nodes are to centralize the material into the city and recycle it back into the market (Widmer, 1996). This leads to the origin of the foreign commodity being brought from a small village, eventually arriving into the markets in Teotihuacan to be sold or traded to the local inhabitants.

Another intraregional model that can give perspective view of the local trade and exchange is in Tula in present day Hidalgo, Mexico. The local consumption model comes from Dan Healan's take on Tula obsidian consumption from local versus non-local obsidian exchange. Healan's model for local consumption of obsidian comes from the amounts of known workshops found in and around Tula and the amount of obsidian from the site (Healan, 1993). Healan explain that the inhabitants of Tula either went to the market area to purchases obsidian blades or cores from a vendor, acquired it from the workshops, or a combination of the two (Healan, 1993). There were four models for long-distance exchange in this article. Model 1 and 2 represent production of obsidian done in a workshop in Tula while model 3 and 4 are worked on a workshop located somewhere else from Tula (Healan, 1993:458). From the results, Healan found the importance of segmented prismatic blades and how the economy of Tula had private sectors with state supervision, this is much different from the idea of long-distance trade and exchange that archaeologists focused in Mesoamerica economy. This emphasis the material that was used by the inhabitants in the site and surrounding area compared to small quantities of material that is used for commodity of status. Focusing on both intraregional and interregional exchange, Healan brought new methodological approaches to economic systems in Mesoamerica. The local obsidian model that Healan present with emphasis on Widmer intraregional model is the basis for my thesis research. Compared to the previous information about Teotihuacan economy, which focus on the trade and exchange of long-distance. These

models focus on the local economy of Teotihuacan and the rest of the Teotihuacan Valley. From both models Teotihuacan economy is expected to be like Tula local obsidian consumption since Tula also utilized the Pachuca obsidian.

Mesoamerica and the Basin of Mexico:

Mesoamerica is a regional area that stretched from modern day central Mexico, Belize, Guatemala, Honduras, Nicaragua, and to some degree, northern Costa Rica prior to contact with the Spaniards in the sixteenth century (Figure 1.2). Not only is the name Mesoamerica a geographical reference but also a cultural and linguistic concept that shares similarities connected by different areas (Joyce, 2004:3). The shared cultural practiced in Mesoamerica comes down to: (1) a basic structuring economy, (2) beliefs on how the world works and practices related to those beliefs, and (3) material signs of social stratification (Joyce, 2004:3). The languages of Mesoamerica are multiple with various dialects in different regions. The dominate languages are Mixe-Zoque, Totonac, Mayan, Oto-Manguean, and Uto-Aztecan (which range from North America to Central Mexico with a dialect called Nahuatl during Aztec time) (Joyce, 2004:10). Variety of small spoken languages: Huave, Tarascan, Xincan, and Lencan are found in specific regions in Mesoamerica (Joyce, 2004:10). These are the key points in what defines Mesoamerica with shared and overlapping of cultural and languages practice and beliefs.

The Basin of Mexico (Figure 1.3) is in present day Central Mexico, and the area is in a high elevated plain surrounded by three mountain range: Sierra de Nevada, Sierra de Las Cruces, and Sierra de Ajusco with low hilltops in the northern section of the Basin of Mexico (Sanders et. al., 1979:81). With the area being surrounded by mountains, it was ideal for people in prehispanic times to settle due to the lake system: Lake Zumpango, Lake Xaltocan, Lake

Figure 1.2 Map of Mesoamerica (Adapted from Sanders and Santley, 1980:258)

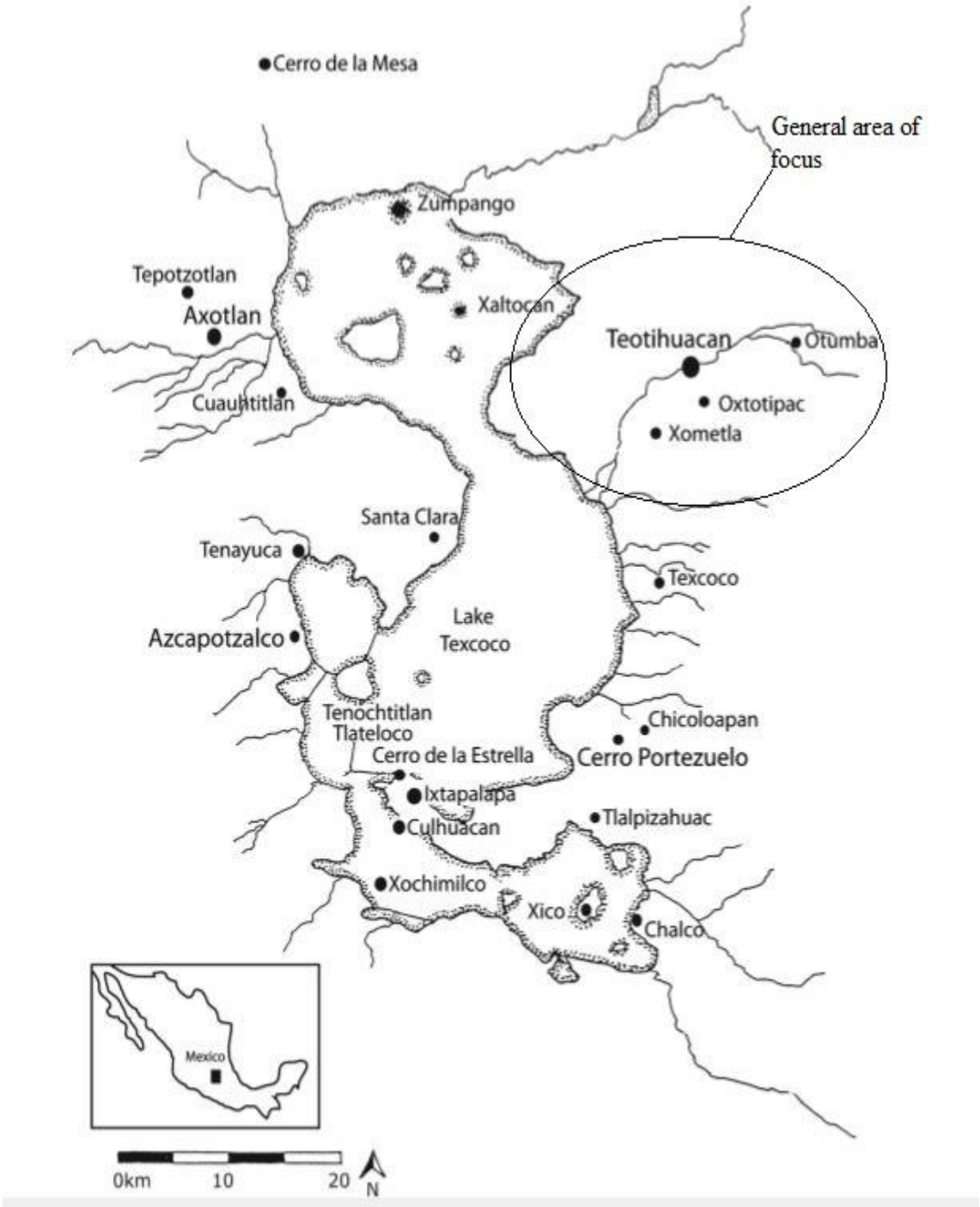

Figure 1.3 Basin of Mexico Map (Adapted from Clayton, 2013:88)

Texcoco, Lake Xochimilco, and Lake Chalco. Sanders et al., (1979) in their comprehensive book*, The Basin of Mexico: Ecological Processes in the Evolution of a Civilization,* gave 9 distinct environments for the Basin of Mexico: (1) lake systems, (2) saline lakeshore, (3) deep soil alluvium, (4) thin soil alluvium, (5) upland alluvium, (6) lower piedmont, (7) middle piedmont, (8) upper piedmont, and (9) the sierra. These environments gave favorable and unfavorable conditions for maize agriculture, a staple crop of Mesoamerica. With the Basin of Mexico having abundant of other resources (salt, lime, wood, and clay) for sustaining large population with natural formed corridors with proximity to resources and exchange network to other regions in Mesoamerica (Carballo and Pluckhahn, 2013:608-609).

Chronology:

The major chronology of Mesoamerica is divided into three phases: Pre-Classic or Formative (2000 BCE-300 CE), Classic (300-900 CE), and Post-Classic (900-1516 CE) with subdivision in each time periods (Joyce 2004:14). Each timeline and region has its own distinct chronology with certain areas flourishing and overlapping each other. During the Pre-Classic period in Central Mexico, settlements consist of small farming villages with some villages having leaders in ritual, war, and other activities, but no permanent, inherited statues prevalent in this time period (Joyce, 2004:14). The Classic period in Central Mexico is where we see the emergence of more permanent settlements with permanent status, resulting in divisions among people in city-states (Joyce, 2004:14-15). The Post-Classic period shared similarities with the Classic period with permanent status, division of people, and large complex cities, but with a larger population.

The chronology that Sanders used in their survey specifically of the Basin of Mexico consisted of five phases: Early Horizon (1500-1150 BCE), First Intermediate (1150 BCE-300

CE), Middle Horizon (300-750 CE), Second Intermediate (750-1350 CE), and Late Horizon (1350-1519 CE). Teotihuacan chronology, is broken down into six phases: Patlachique (100-1 BCE), Tzacualli (1-100 CE), Miccaotli (100-170 CE), Tlamimilolpa (Early phase, 170-250 CE) (Late phase, 250-350 CE), Xolalpan (Early phase, 350-450 CE) (Late phase 450-550 CE), and Metepec (550-650 CE) (Cowgill, 2015). For the purpose of my thesis, I will primarily be focusing on the Miccaolti, Tlamimilolpa, Xolalpan, and Metepec phases because these correspond to the Classic Period when Teotihuacan was at its height. Each of these timelines are based on the amount of pottery sherds found in surface survey done in the late 1960's and early 1970's.

Basin of Mexico and Teotihuacan Survey:

The National Science Foundation sponsored a conference in June of 1960, and from the conference, William T. Sanders and Rene Millon agreed on the division of surveying every known site in the Basin of Mexico (Wolf, 1972: 5). With Millon focusing on the study and survey of the urban center, Teotihuacan, leaving Sanders, Jeffrey R. Parsons, Robert S. Stanley, and many more to survey the Basin of Mexico and its surrounding area between 1960 to 1975 (Millon, 1973; Wolf, 1972:5; Sanders 1965; Sanders et al., 1979). With Rene Millon surveying Teotihuacan to answer his question on who built the first large monumental buildings in the city (Millon, 1960:1), this left Sanders and his colleagues to survey the rest of the Basin of Mexico to find, locate, and record every known structure and settlement pattern in the region (Sanders et al., 1979). The Basin of Mexico has a diverse environment, which Sanders defined as the Central Mexican Symbiotic. The Central Mexican Symbiotic area includes the Basin of Mexico, areas of southern Hidalgo, western Tlaxcala-Puebla, and Morelos (Sanders et al., 1979:4). Much of the

survey that was conducted at that time gave insight about the inhabitants living in the Basin of Mexico.

Sanders oversaw the project due to his previous work in the Teotihuacan Valley in 1955 and his familiarity with the area to design the survey thoroughly. In his work in the Teotihuacan Valley, Sanders had four objectives (1) Trace the development of agriculture, (2) define and trace development of different settlement patterns, (3) construct a population profile, and (4) explore relationship between settlement patterns, agricultural techniques, and demography (Sanders et. al., 1979:5). For the Basin of Mexico, Sanders et al., had two objectives for the survey project: (1) describing the socioeconomic institutions of cultural systems at different time periods, and (2) explain the ecological processes of evolutionary changes on the cultural systems evolved and became a centralized and differentiated environments (Sanders et. al., 1979:5). This was a long and intense project to complete because of the size of the Basin of Mexico and the rapid expansion of Mexico City and other cities.

The amount of surveying, articles written, and excavation done gave much information for the book Parsons, Santley, and Sanders wrote on understanding the Basin of Mexico and the surrounding region of the basin. Even to this day the Basin of Mexico has been the subject of numerous articles written countless times due to the numerous sites, small or large, especially Teotihuacan and understanding the rise of complex societies. The frequently written articles and publications on the Basin of Mexico over the decades have made it a favorable location for Mesoamerican archaeologists to study the rise of complex societies. This is due to the semi-arid area keeping a higher rate of preservation on organic material, and the preservation of architectural structures. One aspect that helps in the Basin of Mexico and archaeology in general is GIS technology (Geographic Information System), this tool helps in storing, manipulating,

analyzing, and presenting data (Gorenflo, 2015:209). This is seen with the many archaeological sites in the Basin of Mexico because of the growing expansion of one of the largest cities in the world, Mexico City. With a large and dense population, roughly 9 million in Mexico City, and the Greater Mexico City population reaching 21 million, much of the area surrounding Teotihuacan and rural sites around the Basin of Mexico have been demolished and covered up by infrastructures of Mexico City and other cities.

Teotihuacan:

Teotihuacan is an important archaeological site and one of the largest prehispanic cities in Mexico and North America (Figure 1.4). The prehispanic city is in a semi-arid highland of the Basin of Mexico and flourished between 150/50 B.C.E. and 550/650 C.E. (Cowgill, 2015:1). These dates focus more on the time when the city was thriving in the Basin of Mexico, but earlier dates provides small villages and hamlets around 300 B.C.E. Despite the decades of intensive work Teotihuacan has received, much of the economy is barely. The reason that the ancient economy is difficult to fully grasp is due to the preservation of inorganic material being abundant in the archeological record compare to organic material that is difficult for preservation. Many factors play in the role of decomposition, but it is usually due to the natural elements being a major factor since exposure to the elements will bring in unknown factors that could increase or decrease the rate of decomposition. The only understanding of the economy of Teotihuacan comes from the archaeological record, and the only account of written records of the economy in the Basin of Mexico comes from the Spaniards before and after the conquest of Central Mexico in the sixteenth century.

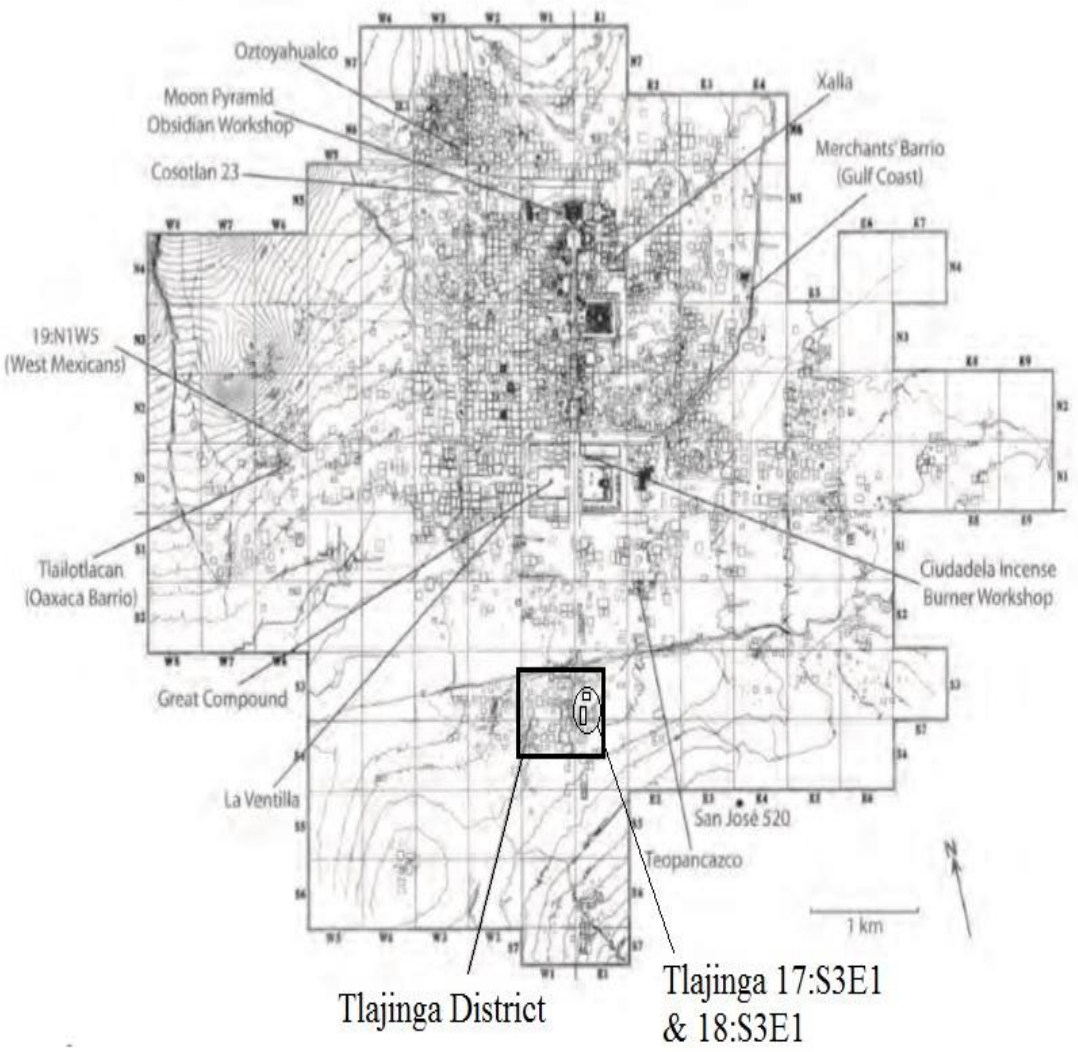

Figure 1.4 Teotihuacan Map (Adapted from Carballo, 2013:116)

Written records would make it easier to understand the economic role material played in Mesoamerica. This is evident with the ethnohistorical documents the Spaniards wrote on the economic roles the indigenous people had during the Late Post Classic and Colonial period, but relying solely on these documents cannot give the full understanding during the Classic period. This contrasts with its southern counterpart, the Maya, a group in the highland and lowlands of Mexico and Central America of whom we have written records, but the records tended to focus on specific dates and important people rather than the economy.

With a population that reached 125,000 people, Teotihuacan would need a kind of organization/distribution system of handling resources to this many inhabitant in the city. In addition to its own resource exchange system in the city it may have had relations with other city-states and smaller communities during the Classic period. These other communities close to Teotihuacan had access to certain resources that the city did not. Teotihuacan could have had influence over the other communities during the Classic period, such as Azacapotlzalco, Axotlan (near Cuauhtitlan), Cerro Portezuelo 15-60 km from Teotihuacan, but influence may have reached even into the Maya area and the Southwest of the modern-day United States. (Cowgill, 2015:157). Many large civilizations over time would try to control Mesoamerica over time, which would have caused other sites to be based on territorial control or strategic outposts (Cowgill, 2015:157). This is not the case with Teotihuacan, where the city influenced smaller communities, as seen with similar architectural design and layout of structure. Maquixco Bajo TC-8 located roughly 5 km west of Teotihuacan was one community that had similar architectural design as seen in Teotihuacan (Sanders et al., 1979: 337). The sheer population size, large monumental buildings, and urban impact of Teotihuacan are contributing factor to the influence it had on other settlements in the Basin of Mexico and Mesoamerica.

Obsidian:

Throughout Mesoamerica, obsidian was a common resource used for tool making by all cultural groups. Obsidian is a lithic material that is categorize as an igneous rock type. Obsidian is formed from volcanic activity, where magma is rapidly cooled down under extreme pressure to minimize crystal growth, which gives it glass properties. Obsidian is a hard and brittle material making it possible to control and manipulate into tools with sharp edges for cutting and piercing. Obsidian is primarily black in color, but depending on other elements in the area it can be found in different coloration and patterns. Varieties of obsidian are found in different parts of the Basin of Mexico thanks to the rich environment of being surrounded by active and extinct volcanoes. These are the types of obsidian found around the Basin of Mexico: Sierra de Las Navajas (Pachuca), Barranca de Los Estetes (Otumba), Pizzarin (Tulancingo), and Paredon obsidian with the farthest obsidian source from Teotihuacan being Ucareo obsidian, located in the present state of Michoacán, Mexico (Charlton, 1978). These are just a few obsidian quarries in Central Mexico. The Otumba obsidian source is the closest to Teotihuacan and Pachuca obsidian is about 50km north in Hidalgo, Mexico (as seen in Figure 1.5). Otumba and Pachuca obsidian are the most common obsidian material found in Teotihuacan. Pachuca obsidian was sought after for its greenish-gold color and high-quality in blade production. Not only is obsidian found in the Basin of Mexico, but in the Valley of Oaxaca, the highland of Mexico, and around Guatemala. This makes obsidian very useful for tool production in Mesoamerica because of the lack of natural metals for the process of metallurgy. Obsidian was important for its tool and weapon use/making, and for being an abundant natural resource within Mesoamerica. Obsidian being plentiful resource in the area would be a good reason for people to maximize the material.

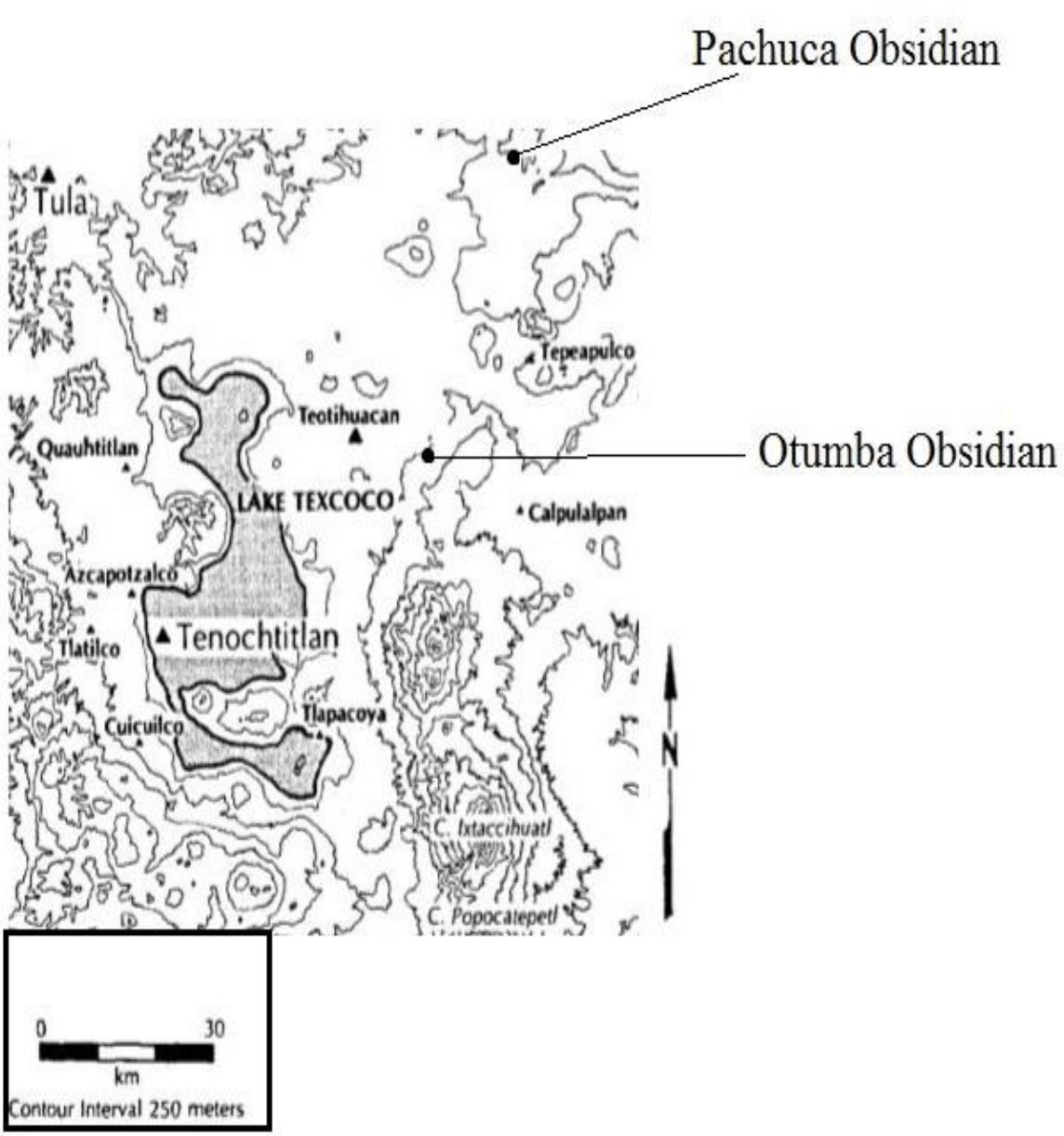

Figure 1.5 Obsidian Source Deposit from the Basin of Mexico and surrounding area (Adapted from Sanders and Santley 1980:251)

Obsidian Artifacts:

The obsidian artifacts that are found in Mesoamerican sites ranges from your basic functional tool like bifaces or hafted bifaces to eccentric obsidian artifacts that have no utilitarian function. The type of tools and material that will be the focal point for my thesis are obsidian macrocores, polyhedral cores, and blades (prismatic blades) (See Figure 1.16-1.8). A macrocore is the first stage in blade production with majority of the cortex removed and having a crude cylinder shape. The key feature of a macrocore obsidian is the platform strike that will be later used to make obsidian blades. Obsidian polyhedral core is a cylinder shape with ridges going down from the platform strike. Once the craft producer has made the polyhedral core, the next step is pressuring prismatic blades from the polyhedral core. Figure 1.6 shows what a prismatic blade looks with its key feature being a long triangular or trapezoid shape depending on the ridges the knapper follows, the bulb of percussion is due to the pressure that was used to remove it from the core. The prismatic blade is divided into three sections: proximal (top section), medial (middle section), and distal (end section). The prismatic blades are "long parallel-sided blades removed by pressure from carefully prepared polyhedral blade cores" (Santley et al., 1995:474). Prismatic blades are a unique set of tools in the archaeological record, useful for cutting or various activities. This is seen through the countless articles from archaeologists who have studied obsidian. There are Spanish accounts of the indigenous people using it for utilitarian purposes, like shaving and cutting, and accounts of symbolic attributes.

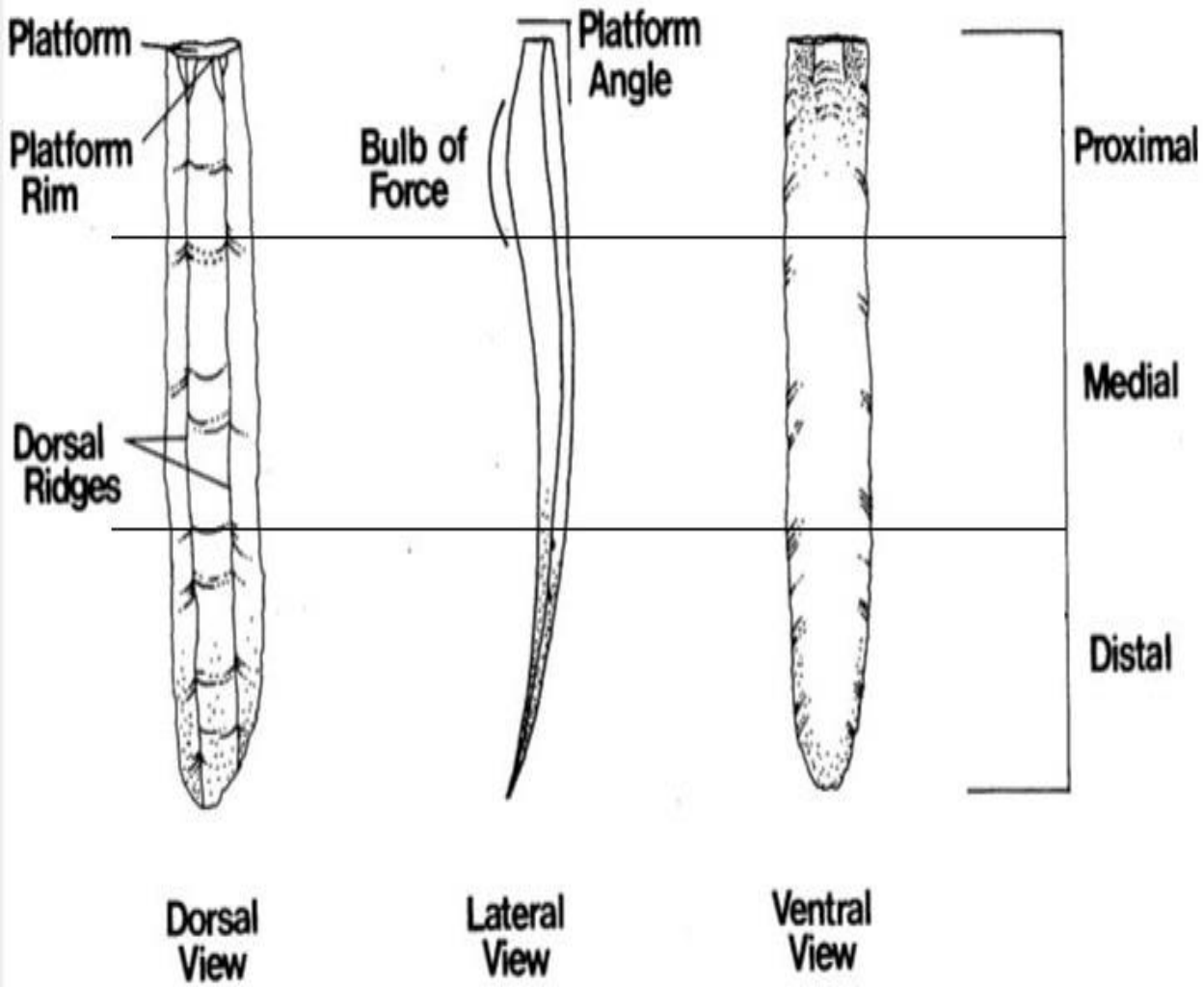

Figure 1.6 Prismatic Blades (Adapted from Sanders, 1995:484)

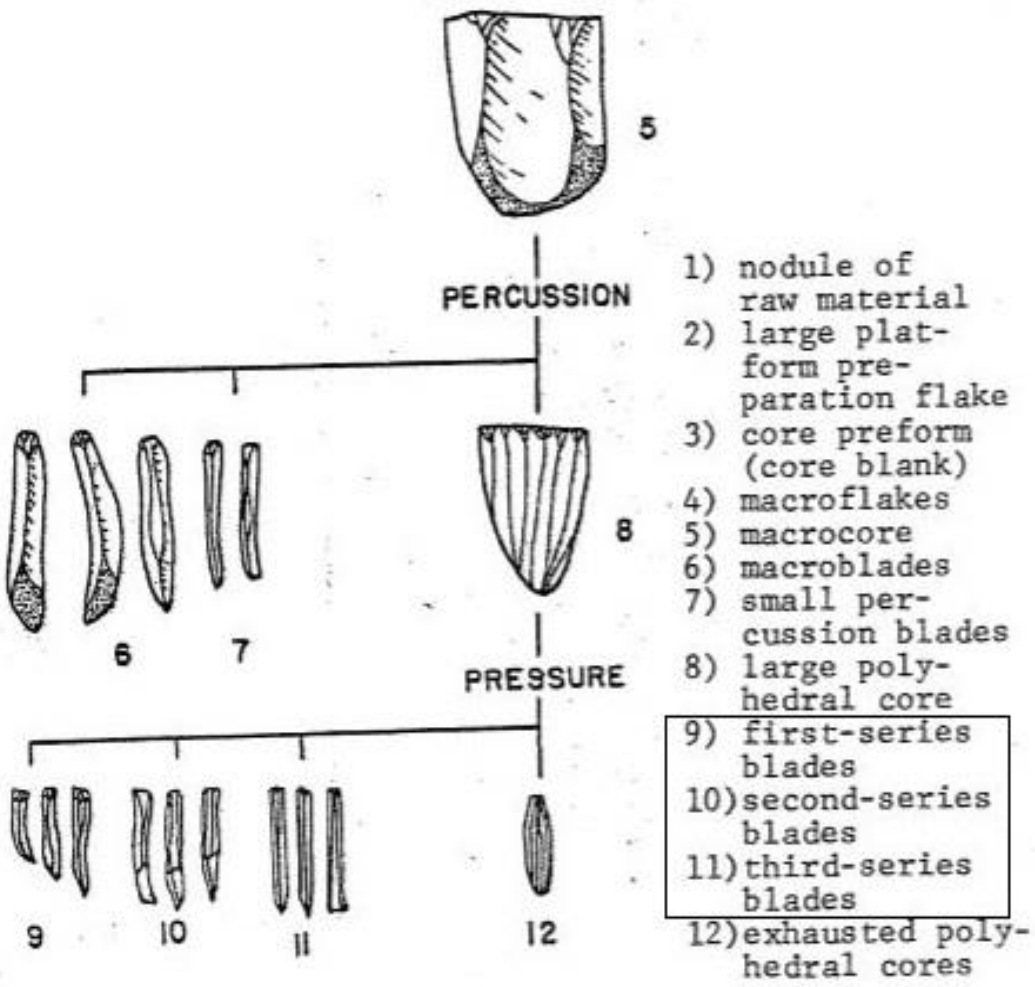

Figure 1.7 Obsidian Core Reduction (Adapted from Clark 1983 Figure 7 cited in Storey, 1985)

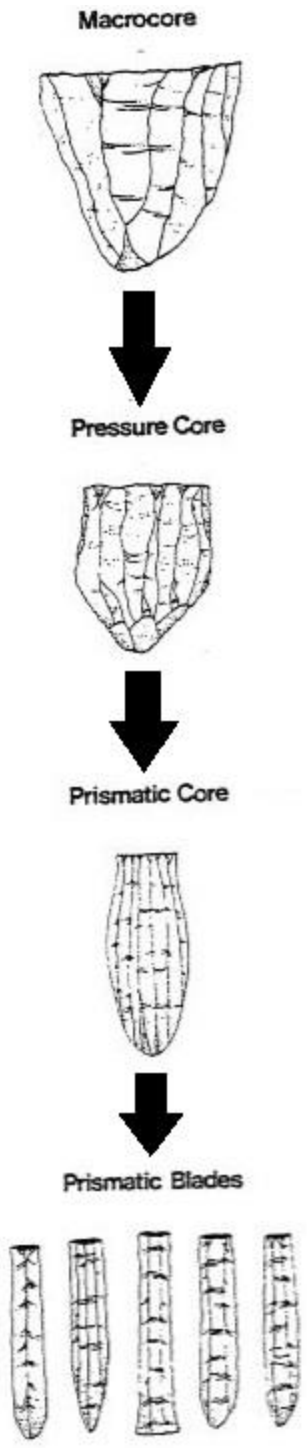

Figure 1.8 Prismatic Blade Core Reduction Sequence (Adapted from Santley et al., 1984:486)

Lithic Reduction:

Flintknapping or the process of removing flakes and making stone tool for usage is the staple for archaeologists in understanding the basic of lithic reduction strategy that shows the behavior process of products and wastage of stone material (Sheets, 1975:372). The preparations for making obsidian macrocores to obsidian prismatic blades as seen in Figure 1.7 and 1.8. The first process is removing the cortex off the obsidian cobble or block nodule through percussion techniques with a hammerstone and preparing a striking platform to create a flat surface to remove macroflakes to prepared ridges for flakes to follow. Once the large flake is removed and a macrocore is made, the next step is following the ridges with percussion and pressure techniques to remove macroblades and reduce the obsidian core into a polyhedral core. The polyhedral core or pressure core key feature is straight ridges that are straight. Once the polyhedral core is made, the removal of irregular blades is done by pressure techniques until ridges are consistent around the core and prismatic blades are being pressure off the core. Once the shape of the core has been formed, then a combination of percussion and pressure techniques to remove the macroflakes from the core for the next phase of the obsidian core. Getting to the polyhedral core is what the artisan is aiming for in the production of prismatic blades. Prismatic blades are the final step for the crafter with three series of blades that are produce from polyhedral cores with the third series being the smallest of the blades. Once all blades that can be removed from the polyhedral core are gone it becomes an exhausted polyhedral core and is either recycled into other obsidian artifact or thrown away.

Experimental Archaeology

In 1968, Don Crabtree did an experimental approach in replicating the process of making obsidian cores and prismatic blades. Experimental replication is one of the key methods for

archaeologists to utilize to see how, in this case, making obsidian cores and blades from ancient Mesoamerica techniques was done. Reading ethnohistorical documents, Crabtree noted the description of the sitting down technique and holding the obsidian polyhedral core between the flintknapper's feet. Crabtree believes this is an improper method due to the knapper not using their full strength to make obsidian blades. The other reason Crabtree believes it is improper is that the obsidian core ridges would be extremely sharp and could cut the knapper's feet (which is something that will happen to any knapper, especially working on obsidian). Crabtree used a crutch tool (which was constructed) to help hold the obsidian core in the ground and used a long pole with bone or antler tip to remove blades through pressure techniques. This proper technique that Crabtree used was done by placing the obsidian core on the ground being held in the crutch and standing over it with the pole of hardwood tip with bone or antler to remove obsidian blades from the core (Crabtree, 1968). This technique will give the knapper a more control led force of fully removing the obsidian blades from the polyhedral core.

Even though Crabtree's 1968 article was ground-breaking in being one of the first experimental replication on obsidian cores and prismatic blades, there was criticism. Crabtree never attempted the sitting down technique that was in the ethnohistorical documents to see if it was plausible to produce obsidian blades with the sitting down technique. The other issue is Crabtree also never constructed the tool that was used for the sitting down technique. In 2003, Gene Titmus and John E. Clark used the method of blade production that was written by Juan de Torquemada with the intention of producing blades with the sitting down technique or "Mexica way". Titmus and Clark first objective for the experiment was to construct the *iztocolotli* from the ethnohistorical documents. The *itzcolotli* comes from the Nathual language and when translated it is call the "obsidian armature", which can be seen in pictures in Sahagun's (1963)

Florentine Codex (Titmus and Clark, 2003:72). When the construction of the *itzcolotli* was completed, it was ready to be used for the experiment. The difference that Titmus and Clark have is using a keen observer with no knowledge of flintknapping observing every aspect of the process in detail to replicate the experiment. Obsidian blades were made using the wooden tool while sitting down making it possible, in this form, to produce blades and compare Crabtree's method of making obsidian blades. From the first replication of Crabtree to the some of the recent written experimental archaeology, it has shown the usage of how blade production is vital to understanding obsidian blades. Even though we know a lot about the production, there are still issues with just going with reduction sequence, without emphasizing or understanding the function of obsidian blades (Widmer, personal communication). This is something that could be looked at in the future by anyone that has any interest in seeing the different ways an obsidian blade can be used.

Part-time and Full-time production

Archaeologists have always used division of labor (different level of work between individuals) to establish the differences in evolution of complex societies. This is no different in Teotihuacan or any Mesoamerican site. The debate is whether the inhabitants in Teotihuacan were part-time or full-time craft producers. The division of labor is thought to be how society would flourish into a large urban center due to the labor being divided to focus it into a refined form and increase production value (Hirth, 2009). The production of each part or full-time craftsman characterizes the different intensity by allowing the account of the amount of lithic or other resources left behind (Hirth, 2009). The earliest part of Teotihuacan economy comes from the exploitation of recourses like obsidian, which was rich in the Basin of Mexico. The Teotihuacanoes did use this opportunity to gather obsidian from the different sources in the area

to be manufacture into tools/weapons (Otumba and Pachuca obsidian being the majority obsidian used in Teotihuacan). The definition and difference between a part-time worker and a full-time worker comes to the amount of time it takes to make the necessary obsidian blades, hafted bifaces, or scrapers that people needed for their daily activities. This is not going to be the issue for this paper because the primary focus of the thesis is the consumption of obsidian and the significant value the people of the Teotihuacan Valley and the Basin of Mexico put on Pachuca obsidian. Compared to the sole focus of division of labor since archeologists do not consider the time when people acquired flintknapping skills and how long an individual have been practicing. Archaeologists go by their own flintknapping experience from the replicating the methods used to create stone tools to determine how ancient people did it.

Symbolism and Duality:

Certain stones like jade and turquoise were valuable for decoration purposes, rarity, and high status associated with these stone, but obsidian is different. Certain kinds of obsidian could be traded and exchanged across the Basin of Mexico and Mesoamerica for the value and association with larger city, like the green-gold coloration of Pachuca obsidian. Pachuca obsidian was not only highly used in Teotihuacan, but other major sites have used it through different time periods. The green color of Pachuca obsidian shares many of the similar green color like jade, turquoise, and malachite to name a few. What makes obsidian different is that certain stones, like the ones mentioned in the beginning of this section, were highly valuable that only elite statues people could obtain due to rarity, but Pachuca obsidian is found in all parts of the Basin of Mexico making it easily accessible to anyone. Other large archaeological sites in Mesoamerica who also utilized Pachuca obsidian for the craft production of prismatic blades are Xochimalco, Tula, and Tenochiltan that expanded after Teotihuacan was heavily decline. This

has shown the favor of Pachuca obsidian for blades and the cultural significant it holds in other Mesoamerican settlements throughout time.

Obsidian symbolism is a fairly new concept in the symbolic approach to the study of Mesoamerican beliefs. Many Mesoamerican groups saw the world in a duality of both the natural and supernatural world as one. A duality of both the natural and supernatural realm to infused into one through the Mesoamerican cosmology belief. This sense of dual opposition is the creation of understanding the world that the people of Mesoamerica saw, a world that is divided into a state of equilibrium (Lopez-Austin, 1988:52-53). Saunders define this duality in the Mesoamerican world-view as "the cross-media sensual dimension which links objects to landscape, deities, myth and everyday life" (Saunders, 2001:221). As I mention earlier in the paper, obsidian can be found in volcanoes, mountains, and underground. These landscapes are revered as sacred locations for ancestors, spirits, and animal familiars by the people of Mesoamerica (Saunders, 2001:221). This duality can be shown with obsidian because obsidian is the most common stone material found in the Basin of Mexico. A form of duality that is common in Mesoamerica beliefs is night and day. A concept of two different entities that resembles each closely due to the nature each role has. Another is life and death, it is a cycle that is a common belief in Mesoamerica and other cultural groups. This is shown with the different realms in Mesoamerica beliefs that incorporate a heaven and the underworld with specific items and deities associated with each realm. With many of the items of being incorporated in different realms as blood needed to be given back to the gods or people emerging from a stalk of corn in the ground.

An issue that does stems from the depiction of obsidian in iconography is the resemblance to flint (Taube, 1991:65). Flint and chert are other lithic material found in

Mesoamerica, but only small quantities of it are found in archaeological sites compared to obsidian. What makes it difficult in identifying the lithic material in iconography is both lithic materials were used to make tools and weapons. When Spaniards and missionaries were writing their accounts of the indigenous people using lithic material they gave vague observation and would interchange the word they gave for obsidian and other lithic material. Obsidian is the most common lithic material in Mesoamerica, so the *Florentine Codex* and other written accounts were referencing obsidian in imagery and iconography because of obsidian being used for over three thousand years.

This would show the importance of obsidian to Mesoamericans because of obsidian prolong usage in both domestic and ritual context in everyday activities to being symbolically associated with certain deities. With each realm of heaven and the underworld being depicted with a god and minor supernatural being as a conjunction pair for world order (Lopez-Austin 1988:56). With obsidian mainly associated with the underworld realms due it being part of the earth, an entity that is effeminate with being the one to give life and where life is rested (Lopez-Austin, 1988). There are realms in Mesoamerican cosmology that have names associated with obsidian (Lopez-Austin, 1988:54-55). A total of 3 realms of duality are in the Mesoamerican underworld cosmology with names depicted as: The Obsidian Mountain, The Place of the Obsidian Wind, and The Obsidian Place of the Dead, The Place Where Smoke Has No Outlet (Lopez-Austin, 1988:54; Saunders, 2001:224; Matos Moctezuma, 1988:129). This component of life and death duality should be incorporated in the acquisition of obsidian because of the function and symbolic approach Mesoamericans saw with their cosmology.

The most common symbolic imagery of obsidian comes from the deities whose name or imagery is associated with obsidian in the iconography of the Post Classic period. Itztli derives

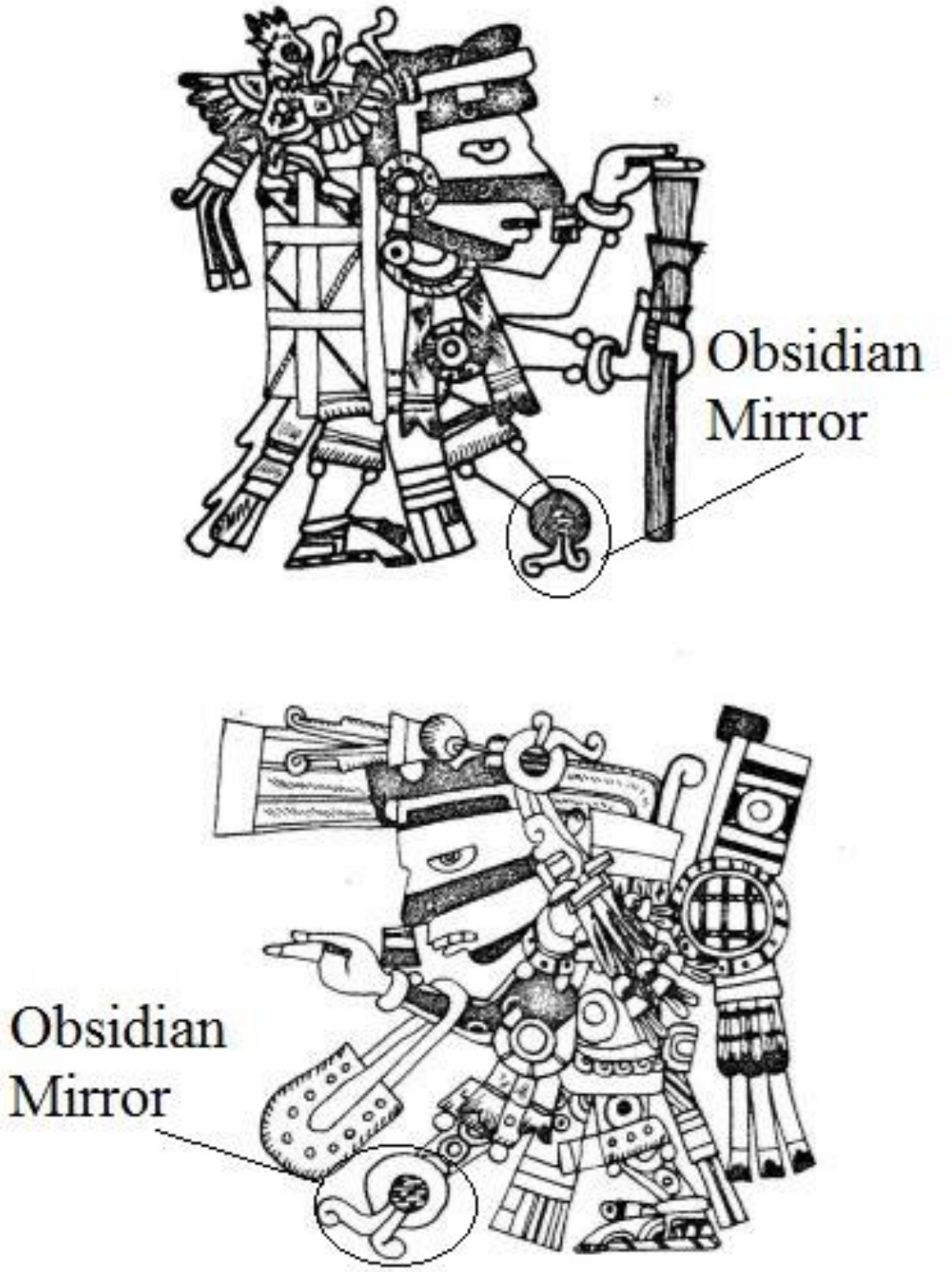

Figure 1.9 Tezcatlipoca (Adapted from Heyden, 1988:236)

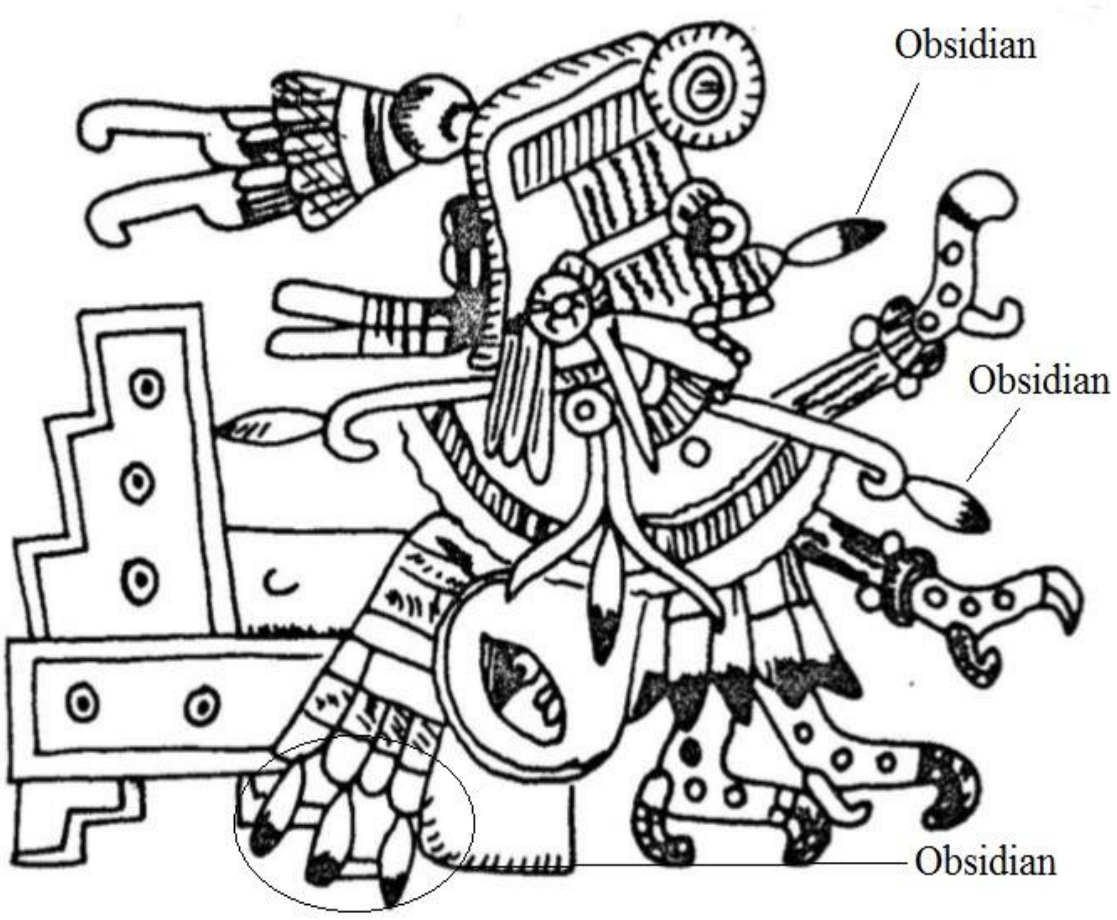

Figure 1.10 Itzpapalotl (Adapted from Heyden, 1988:230)

Figure 1.11 Itzlacolouihqui (Adapted from Heyden, 1988:232)

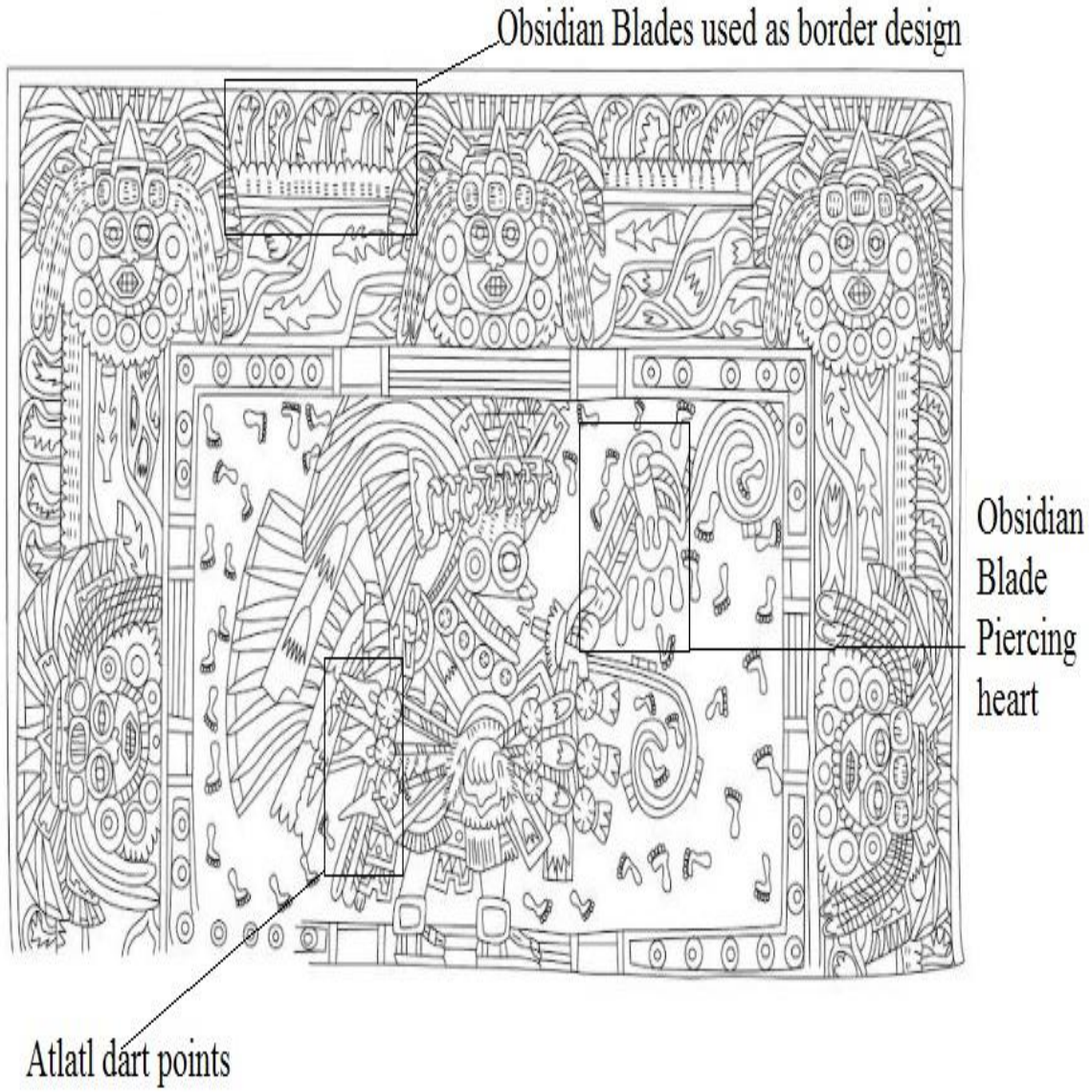

Figure 1.12 Teotihuacan Warrior with Obsidian Blade (Adapted from Headrick, 2007:73)

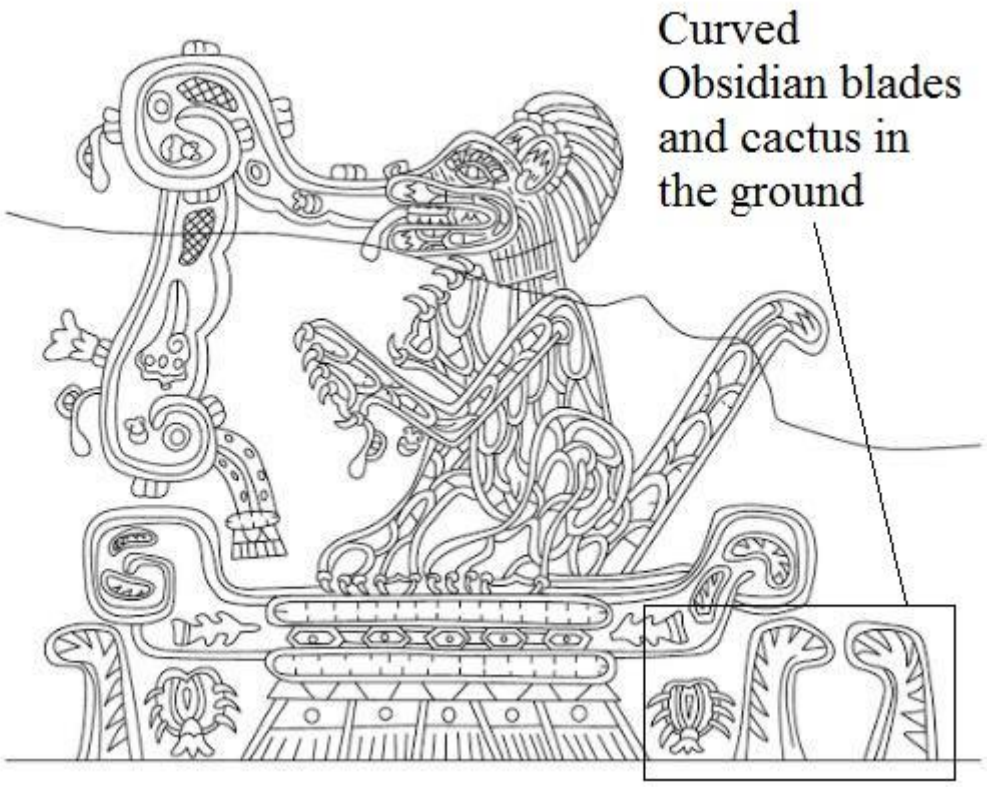

Figure 1.13 Canine with Obsidian Blades and Biznaga Cactus (Adapted from Headrick 2007:82)

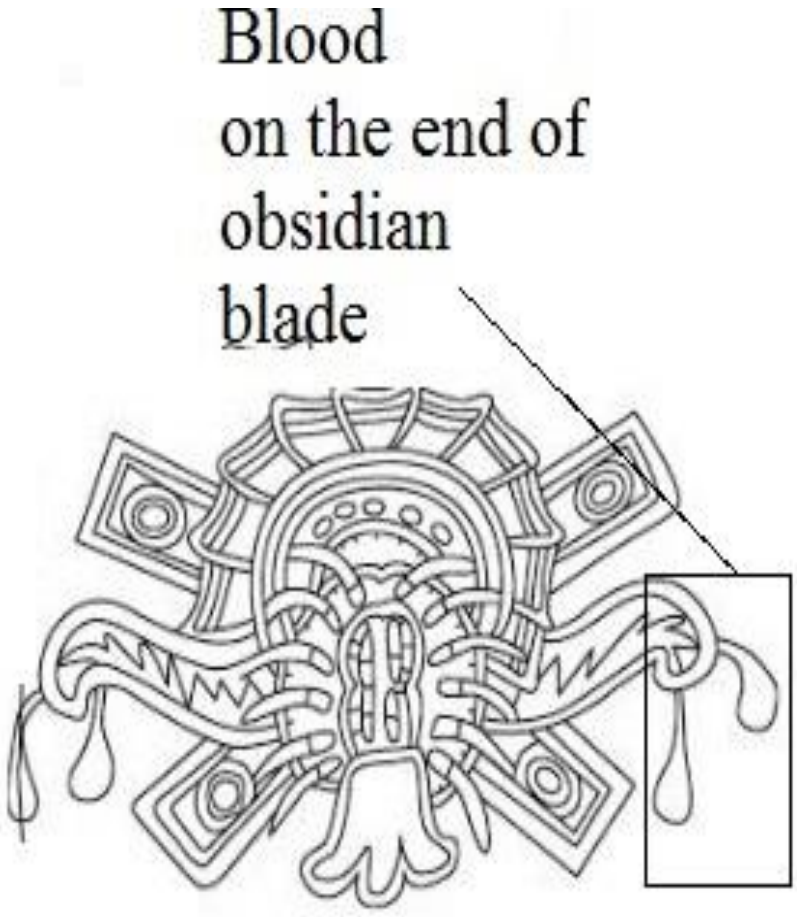

Figure 1.14 Obsidian Blades and Biznaga Cactus (Adapted from Headrick, 2007:82)

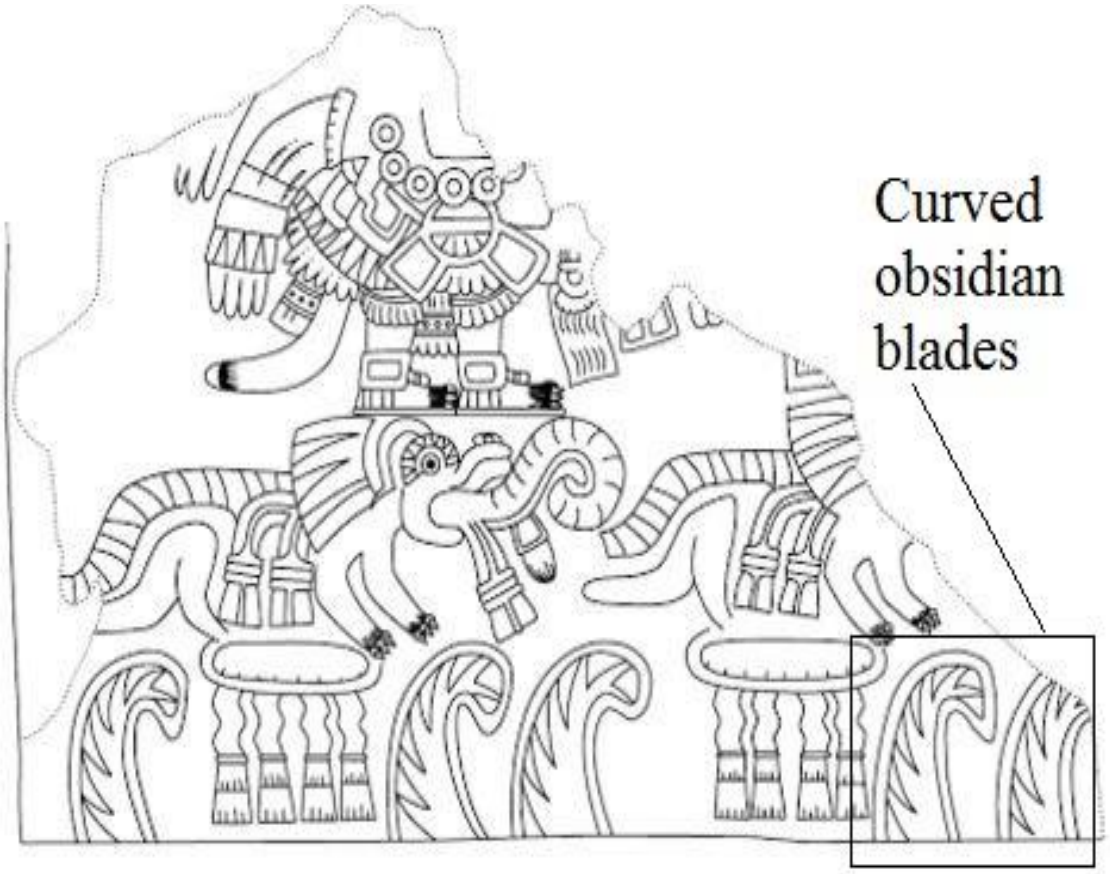

Figure 1.15 Obsidian Blades in the Ground (Adapted from Headrick, 2007:82)

from the Nahuatl language meaning obsidian or curved obsidian, and one of the nine gods of night and of the underworld (Heyden, 1989:221). Figure 1.9 shows a deity from the Post Classic period; the Aztec god, Tezcatlipoca (Lord of Smoking Mirror), who is shown to have a possible obsidian mirror instead of a foot. Scholars' depiction of the mirror said it is made from obsidian depicting one side being black and the other side a shaved reflection (Borges, 2003:85). Obsidian was not the only material to be used to make mirrors, but it shows a different kind of reflection that compared to ones made from iron pyrite that gives off a clear reflection (Parry, 2014: 280). With seeing different kinds of material being used to make mirrors, it could be a way to show different reflections of whoever look upon the mirror since Mesoamerica beliefs stems from duality, but this is still an open debate (Parry, 2014: 280-281). Figure 1.10 depicts the goddess, Itzpapalotl whose name translate to the "obsidian butterfly" in the Nahuatl language. Itzpapalotl is shown to be depicted with obsidian wings or claws. Figure 1.11 depicts Itzlacolouihqui, where the deity name translates into "curved obsidian". Itzlacolouihqui is shown with a curved head piece which are cover with pointed triangular shapes that resembles obsidian edges. Tezcatlipoca and the other deities that are mentioned are associated with the people of Central Mexico mythology. Showing the depiction of the gods, it reflects the people's association between obsidian and cosmology during the Post-Classic. These are the deities that will bring the symbolic approach for my argument on viewing obsidian not just as a utilitarian item, but as a combination functionality and symbolic entity.

Post-Classic Obsidian Iconography:

In Taube's 1991 article, he writes about the iconography of obsidian in Central Mexico where much of the writing on obsidian cores and blades was during the Late Post Classic and Early Colonial periods. Taube was invited to attend a flintknapping demonstration, and during

the demonstration he saw how prismatic blades are curved in the distal end. The reason prismatic blades are curved is because the obsidian core is a cylindrical shape and pressuring the blades take a slight cylindrical outline. Seeing upon the curved obsidian blade, Taube was reminded of the curved obsidian blade from the *Codex Mendoza* and *Matricula de tributos* (Taube, 1991:62). This is important because we do see curved blades in iconography through space and time in Mesoamerica through the context of curved items. In the Teotihuacan murals that will be presented later in the paper, the depiction of over exaggerated curved blades is a strong indication of being made from obsidian. This is very different from the realistic view of obsidian prismatic blades, which have a slight curved end. The obsidian blades from the iconography are curved to the point of resembling hook objects. Why is knowing the curve of an obsidian blade important? As seen in the images from the Codex's and other historical documents, Taube used in his article and the murals from Teotihuacan, it shows through time the indigenous people of Mesoamerica depiction of curved objects that resembles obsidian blades.

Taube wrote about the accounts of obsidian blades usage in daily activities from the Spaniards and missionaries documents and images left behind. The depiction of obsidian blades by the Spaniards saw the indigenous people of Central Mexico used for food preparation and as implements as a cutting tool. As seen in Taube description of an obsidian blade used to cut hair and shaving, it was also used as a form of punishment or medical practiced (Taube, 1991:66). One way an individual would be punished is be put into a small locked cage and have the inside of the cage be surrounded by obsidian blades, where the individual is left to be stabbed by the obsidian until death (Saunders, 2001:224; Taube, 1991:66). The medical practice that was seen by the Spaniards were in the Colonial period and saw obsidian being grinded into a powder to be put into the eyes for cataracts (Saunders, 2001:224) Taube also makes note on segmented

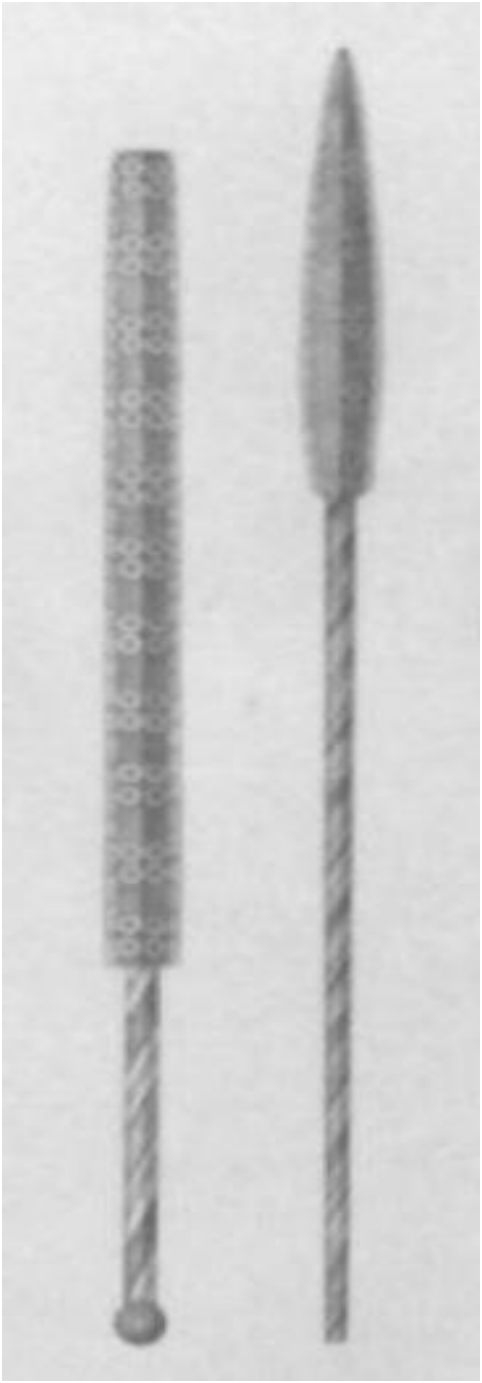

Figure 1.16 The two types of *macuahuitl* (Adapted from Nickel, 1984:172)

obsidian blades on the edges of *macuahuitl*, but the issue with the *macuahuitl* is the weapon has not been found in the archaeological record in Teotihuacan or Tula (Taube, 1991). These are the largest urban center in Mesoamerica during the Classic and Epiclassic period that had strong emphasis of acquiring obsidian. The only account of a *macuahuitl* during the Classic period comes from stela 5 from Uaxactun, Guatemala, where an individual wearing Teotihuacan garb holding an atlatl thrower, spears, and a *macuahuitl* (Taube, 1991:65). An issue that people can see with the depiction of the weapon in question is shown to have large gaps between each set of "blade". Making it difficult to identify if obsidian was in use because other materials could be used for the serrated edges, like other types of lithic material since the stela came from the Maya area. This idea of the blades being separated stems from the replication of *macuahuitl* from modern replication of the weapon. Another reason the gaps between the blades is not accurate is the blade edges could get caught on the cotton armor that was used by the Mesoamerican warriors (Widmer, personal communication). As mention before the weapon has not been found in any archaeological sites and the only known authentic *macuahuitl* came from the *Real Armeria* in Madrid, Spain. Where the *macuahuitl* originated from Montezuma, which shows the weapon with segmented blades, but no gap between each obsidian blades (See Figure 1.16), but unfortunate the weapons were destroyed in a devastating fire in July of 1884 (Nickel, 1984:163). The reason for the obsidian blades to have large gaps in the iconography to be able to distinguish, just like the exaggerated curved end of the obsidian prismatic blades.

Besides the weapon and simple function of the obsidian blades that Taube mention, there was ceremonial purpose for obsidian blades. A ceremonial ritual that was practiced in Mesoamerica time was bloodletting. William Parry mentioned in the final chapter of Carballo and Levine (2014) book, *Obsidian Reflections: Symbolic Dimensions of Obsidian in*

Mesoamerica, of prismatic blades being used and different in ritual context and domestic context. The difference of the obsidian blades in the ritual context is the blades would be intact and narrow with a pointed tip and minimal use wear, while domestic obsidian blades are broken into segments that are wider with retouch and heavy use wear (Parry, 2014: 296). With using obsidian blades, all it would take is a one-time small incision on an individual to offer blood due to the extreme sharpness of the blade to draw blood from the individual.

The symbolic approach for obsidian will come from the murals and imagery that are found in Teotihuacan. I will present 3-5 images (See Figure 1.12-1.15) that represent how the people of Teotihuacan saw obsidian blades beyond the tool function. With comparison of scholarly articles that had an intake from imagery of Post-Classic deities and from the written accounts of the Spaniards. The reason for this idea is Mesoamerican cosmology is based on a sense of duality, where naturally occurring material has a spiritual essence. The obsidian blades in the murals is shown with blood or material referencing blood. This shows the life and death duality that is common in Mesoamerica since it was the gods that gave their blood to give life to the people of the land. As mentioned earlier, this has been an important concept of the Mesoamerican beliefs. Believing that both entities have significant roles in the Mesoamerica cosmology. One of these significant roles is the use of obsidian blades and other material for bloodletting because it was believed that the gods gave their own blood to create humans. This autosacrifce or sacrifice is seen in the iconography throughout Mesoamerican, but it is a difficult concept to prove without evidence of obsidian with blood residue. Much of the imagery that I will be using will have images depiction of “sacrificing”.

Ritual Aspect:

We know that in Mesoamerica the importance of obsidian in tool/weapon making, but knowing the relationship between obsidian and the people who used obsidian beyond the utilitarian function can gives us context of the material and the ideational worlds of Mesoamerica (Levine, 2014:14). An example of the symbolic views of obsidian is in burial context and offerings. In Teotihuacan three major apartment compounds: La Ventilla B, Tlajinga 33, and Oztoyahualco were excavated, and found some individuals buried with obsidian blades and points (Parry, 2014). Some of the buried individuals were children or infants, yet still had blades buried, showing the importance, the inhabitants of Teotihuacan placed on obsidian blades. Besides the hafted biface, scrapers, blades, and other biface artifacts, obsidian eccentric artifacts have also been found. These obsidian eccentrics usually take unusual shapes that served no utilitarian function, but probably served as commodity for prestige or status gain within their own culture.

Cache offerings was another important ritual aspect to many Mesoamerican cultures. Cache offerings of various degrees are found in Mesoamerica that have significant cultural artifacts that people intentional buried. These offerings could be a mean to hide personal or important items to not be used or an offering made to a supernatural realm to help in a time of need. This is another indication that can be used to see if the Pachuca obsidian was designed in this manner and a reason to be traded in the Basin of Mexico (Carballo, 2014). As it will be stated later in the paper about the recent excavations in the Tlajinga district in the past few years. A cache offering of Pachuca obsidian cores of large quantity were buried. Details about the purpose of the offerings are still being debated, but this can show interpretation on people making the offering to some water entity as more detail will be explained later in the paper. The

burial remains and the offering that were intentional buried as grave goods and cache offerings of obsidian and other artifacts can show the symbolic importance the people of Mesoamerica. Better understanding of the belief systems Mesoamerican from the examples that have been presented could give insight of the ritual aspect of obsidian and its association with Mesoamerican belief systems.

Statement of Problem:

In my thesis, I expect to find whether there is a strong emphasis on the trade and exchange of Pachuca obsidian in an intraregional model for Teotihuacan, with a strong focus on the relationship Teotihuacan had with other communities by asking the following questions. These are the questions I will be asking of the intraregional trade and exchange of Pachuca obsidian in the Basin of Mexico. Who was benefiting from the trade and exchange of Pachuca obsidian? What type of social organization is needed for local trade and exchange of Pachuca obsidian? Was the distribution system under elite control or was it an independent market where elites helped operate instead of control over the obsidian? Did certain people from the Teotihuacan travel to the obsidian source or was the Pachuca obsidian distributed by small communities in bulk until reaching Teotihuacan? Was Teotihuacan keeping the higher quality of obsidian and distributing lower quality to other parts in the Basin of Mexico? What was the intraregional interaction with other sites and did the interaction gave the small communities different social status in Mesoamerica (Stoner, Nichols, Alex, and Crider, 2015:19)? Was raw Pachuca obsidian worked at a Pachuca quarry site or gathered at the Pachuca quarry and brought back to a small outlet sites or Teotihuacan? Was the Pachuca obsidian coming into Teotihuacan as raw, macrocores, polyhedral cores, or finished products? Are completed prismatic blades

being traded or are the prismatic blades being broken into segments and traded? If segmented prismatic blades were traded, what section of the blade pieces were traded and what was kept? Was Pachuca obsidian first moved within Teotihuacan or was it ready to be transported outside the city? What symbolic values did people in the Basin of Mexico have on obsidian especially with Pachuca obsidian?

These are the questions that I am asking for the intraregional model of the Pachuca obsidian in the Basin of Mexico. A hypothesis that will see the type of trade and exchange of is the intentional breakage with prismatic blades and believing the medial of the blades to be the more desirable part and will be highly kept in Teotihuacan while obsidian cores and small whole or distal and proximal blades will be traded outside the city. The further these cores and blades are from the central point (Teotihuacan) the smaller and lesser quality the Pachuca obsidian will be (outside central point). This can give us a small insight in the economy of Mesoamerica from the vast amount of obsidian coming in and out of cities, but just looking at one type of resource alone will not give us the full understanding (Hirth, 1984). Even if that is the case one can still get the symbolic relationship obsidian played in Mesoamerican culture. Instead of just solely looking at obsidian as tools, I will incorporate obsidian artifacts in a ritual or symbolic context in the trade and exchange intraregional model.

Chapter 2: Background History

The Rise of Teotihuacan:

An ancient city, Teotihuacan was one of the largest cities that was built in the New World. Teotihuacan started out in 100 BCE and continued until major structures in the city were destroyed by a major fire around 550 CE and fully abandoned around 650 CE. Much of the chronology of Teotihuacan is based on the type of pottery sherd and the density of the type of sherd present during the surface survey of the Basin of Mexico by Sanders et al.

It was during the Patlachique phase when Teotihuacan began it ascendance to urbanism. Starting out like other small settlements in the Basin of Mexico and grew to the size of another large settlement at that time, Cuicuilco, which had an estimated population of 20,000. It is believed that the reason Teotihuacan grew so rapidly was due to Cuicuilco had suffered not one, but two volcanic eruptions. The first eruption was from Popocatepetl which erupted roughly between 200-0 BCE, which covered a good amount of Cuicuilco (Siebe, 2000). After the first eruption, Cuicuilco population was declining and majority of the population moved in the northern area, in and around Teotihuacan, helping the city further expand its population. The second eruption came from Xitle, who sealed the fate of the Cuicuilco. With Cuicuilco being destroyed by the two eruptions, Teotihuacan emerged as the largest settlement in the Basin of Mexico in the Classic Period.

Pachuca obsidian Source

One of the first papers that surveyed the Pachuca obsidian source was by William Holmes in 1990. Holmes did a small expedition to the obsidian source in the Sierra de Las Navajas Mountain that took a few days of traveling. In his article, Holmes described the large

amount of obsidian debitage that litter the ground (See Figure 2.1) where miners would mine obsidian cobble and nodule blocks and workmen worked on the preparation of macrocores (Holmes, 1900: 410). Holmes mentioned small structures of walls, but no excavations were conducted at the time because the expedition only lasted a few days.

Multiple zones are found in the area with large dense or intermittent concentrations of Pre-Hispanic obsidian mines: El Durazno, Oyametal, San Lorenzo, and Este. The first type of mines were shallow conical pits with diameters up to 2.6 meters and a depth between 0.6-3 meters (Cobean, 2002). The second form of mines are pit-shaped and only found in El Durazno area and consists of very large craters between 6-10 meters deep and 30 meters in depth (Cobean, 2002). The third and most famous mines that are found are the narrow vertical shafts that reached a depth of 20 meters with large doughnut-shaped piles of obsidian flakes (Cobean, 2002, Pastrana, 2002:19). These are probably the mines that Holmes mentioned due to his guides warning his crew about the pits that were hidden by the vegetation in the Valle de la Hacienda, Zona Central Oeste, and Zona Este (Cobean, 2002: 41). The various forms of excavation and the amount of obsidian flakes has shown the heavy and intensive process of gathering Pachuca obsidian. Even with the amount of activity that has been shown at the Pachuca source, not much has been seen from the Classic Period. We know Teotihuacan had large quantities of Pachuca obsidian, but of the few surface surveys at the source, only a handful have shown small amounts of artifacts from the Classic period (Pastrana, 2002:16). This does not mean that Teotihuacan activity did not exist. It just means further investigation is needed to fully understand the activity at the obsidian source during the Classic Period.

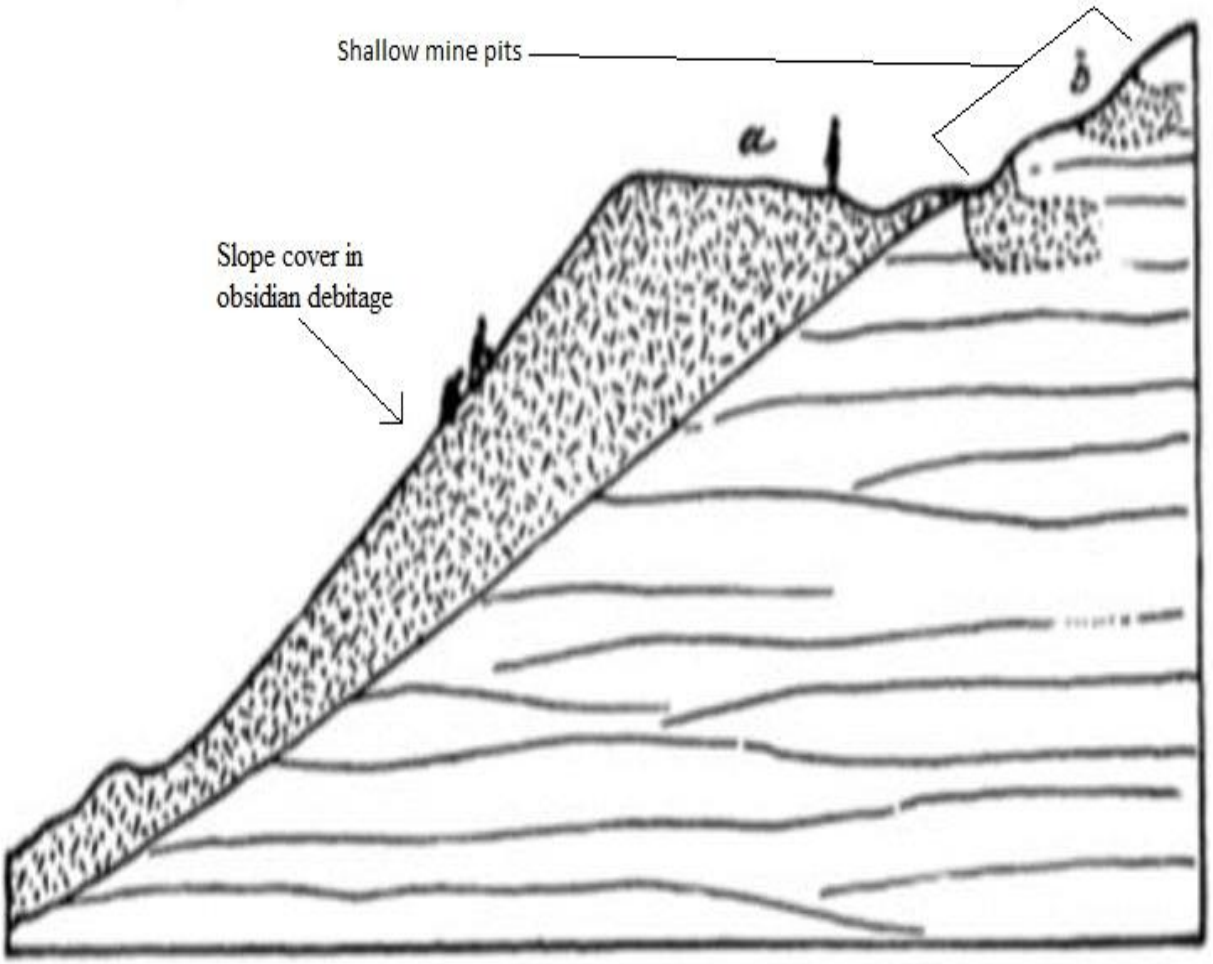

Figure 2.1 Drawing of the Pachuca obsidian Source with large amount of debitage

(Adapted from Holmes, 1900:410)

Teotihuacan Economy:

One of the debates regarding Teotihuacan is whether the city was a controlled market or individualistic market (Clark, 1986; Santley, 1983; Santley and Pool, 1993; Spence, 1981, 1987). Using deposited archaeological material, archaeologists may conclude whether the materials found played a larger role in the socioeconomics of Teotihuacan society. One aspect archaeologists can look at is what value past people saw or gave to the materials around them. What makes this a difficult connection is how we determine the value of the cultural materials left in the archaeological records for trade and exchange. Our perspective of the material is crudely different from ancient people views since all we to know is from their artifacts that are found in the archaeological records.

Teotihuacan was a place that archaeologists have looked at the trade and exchange system due to having a large and dense population. The idea of trade and exchange within the Basin of Mexico stems from the rise of many powerful centers in each distinctive period, with this thesis focusing on the Classic period. A reason for trade and exchange is the political and economic gain from acquiring exotic and necessary resources to maintain a large population. The Basin of Mexico had plenty of natural resources due to the different environments, as mentioned earlier, which ranged from clay for ceramics and different species of trees for firewood, to lime for plaster, etc.

Teotihuacan Obsidian:

The first archeologist who studied the obsidian material from Teotihuacan was by Michael Spence (Spence, 1967, 1981, 1987), who looked at how Teotihuacan obsidian played an important role in the city layout and the industry the city had in obsidian. When discussing the

craft production of obsidian in Teotihuacan, Spence's idea was that the city infrastructure was laid out because of the placement of obsidian workshops. Having these obsidian workshops caused the city to layout the foundation of certain types of workshops to be situated certain areas. Spence focused on the obsidian from surface surveys from the Teotihuacan Mapping Project and associated any high density of obsidian in the surface with obsidian workshops.

In his analysis, Spence saw the socioeconomic evolution of obsidian workshop with concluding different types of workshops and the locations of the workshops in the city. In his earliest article, Spence gives reasons that the high number of the obsidian workshops was a factor in the city's rapid growth and influence (Spence, 1967). In the Tzacualli and Miccaotli phases, workshops were situated on the city's edge, while in the Tlamimilolpa and later phases workshops were situated in the center of the city (Spence, 1967:513). Spence did further analysis of the obsidian production in Teotihuacan after his 1967 article. In *Obsidian production and the State in Teotihuacan*; (1981), Figure 2.2 shows the obsidian workshops Spence believes are located and gave three different types of obsidian workshop: local, precinct, and regional. Spence defined each obsidian workshop with the location, density of obsidian, and production of artifacts with each type of workshop being categorized as specialized, semi-specialized, or for general purposes.

The first of these workshops Spence discussed is the local workshops which were situated outside the center and had slightly heavy obsidian surface cover, with production focusing on a full range of obsidian artifacts (cores, blades, biface, knives, and scrapers) (Spence, 1987:771). Being outside of the center of the city, the local workshop was primarily intended for

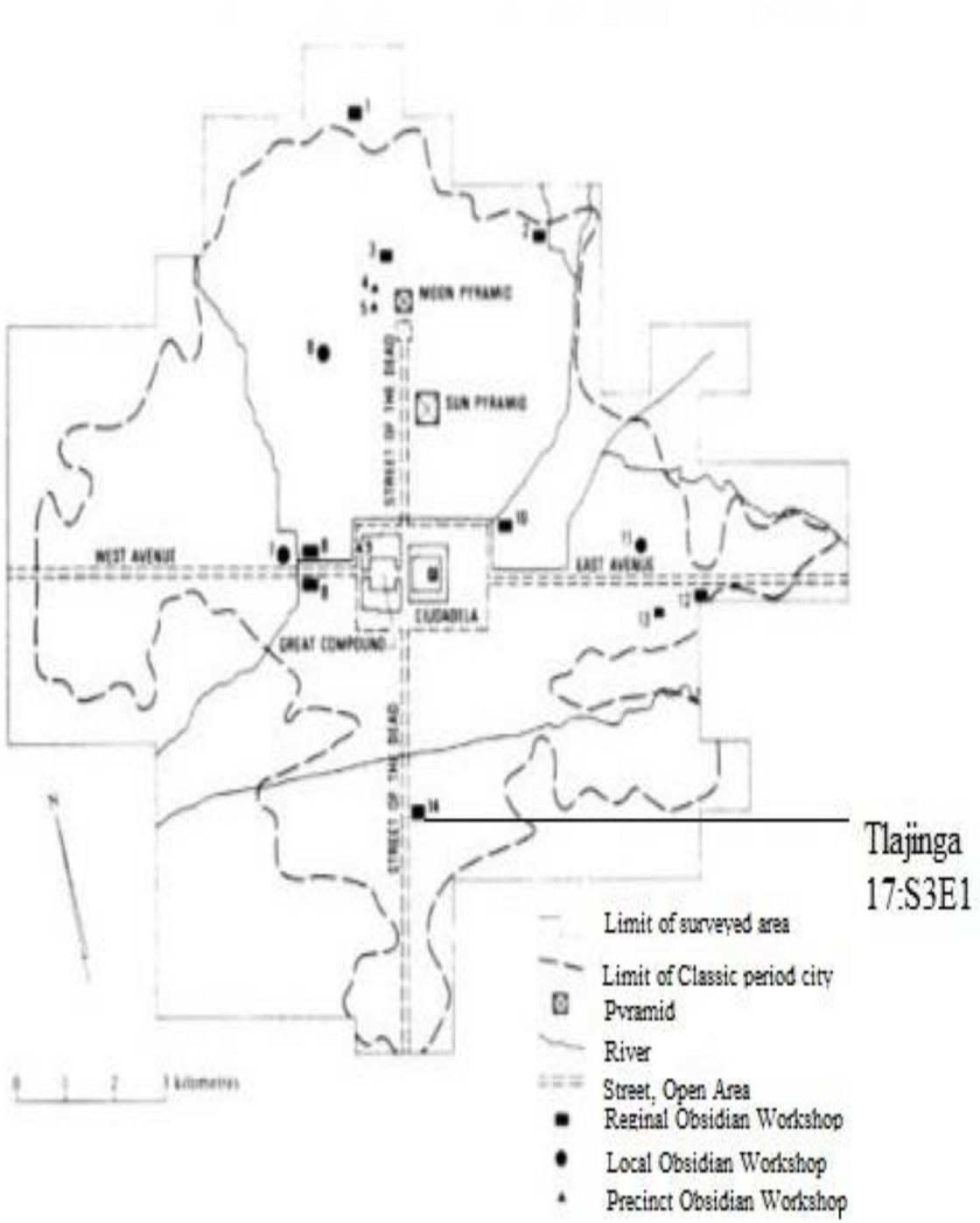

Figure 2.2 Obsidian Workshop Map (Adapted from Spence, 1981:770)

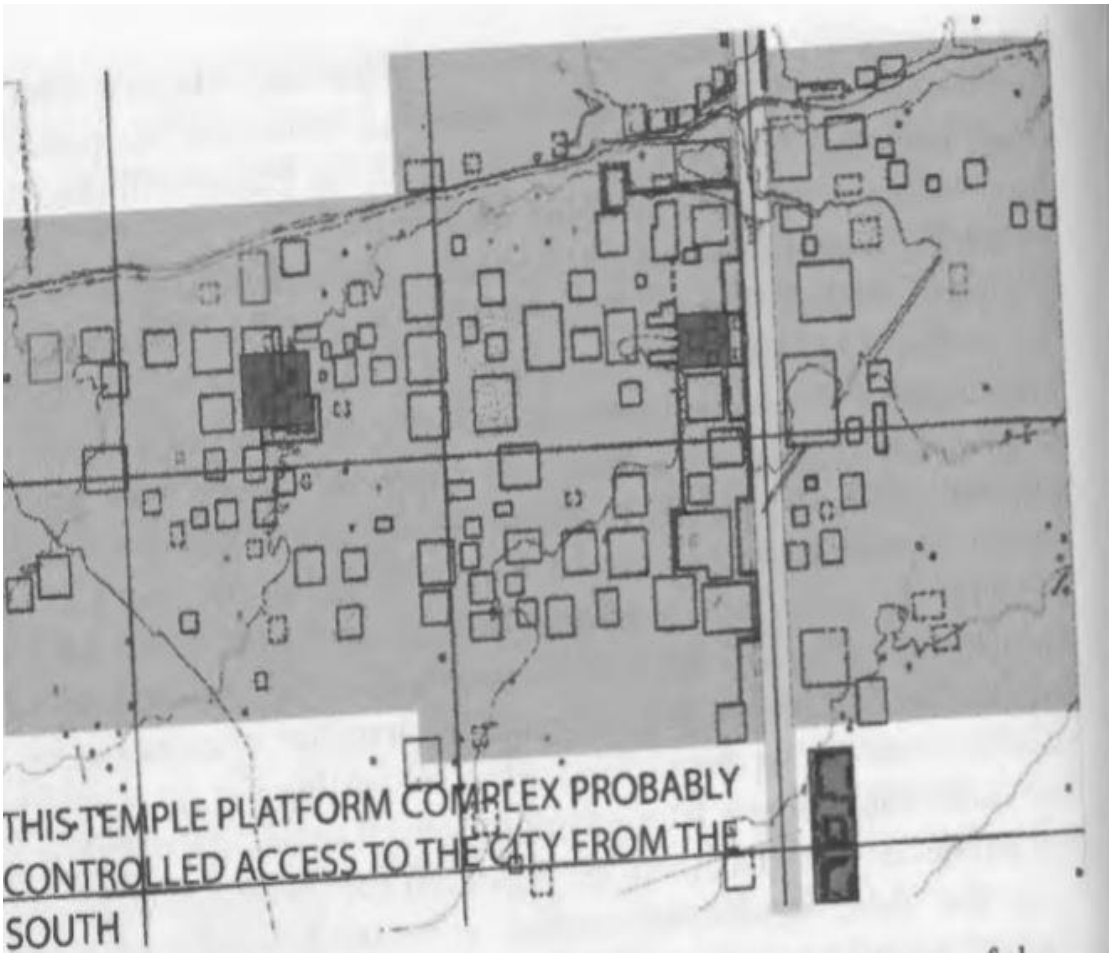

Figure 2.3 Tlajinga District with Temple Map (From Widmer and Storey, 2012:110)

local consumption, and were in the East and West with direct contact with consumers (Spence, 1987:771).

The second workshop Spence identify is the regional workshop, a workshop that is situated near large public structures or areas in the central zone and have denser obsidian surface compare to the local workshops (Spence, 1987: 771). Because of their denser obsidian surface, Spence suggested the regional workshop was both specialized and subspecialized and intended for production of a wider market for exporting outside the city with production focusing on cores and blades, or only bifaces, or a combination of both (Spence, 1987: 771). Of the 14 obsidian workshops in the map, site 14 (see Figure 2.2) is the recently excavated Tlajinga 17:S3E1 that fits the criteria of Spence regional workshop. With the site being specialized in blade production, large dense concentration of obsidian, and being situated next to the Avenue of the Dead and across from a temple (See Figure 2.3).

The third and final workshop in Spence identification is the precinct workshop. The precinct workshop is located near major structures and by Spence interpretation of the obsidian workshop to be were involved under state supervision (Spence, 1981:771). Each of the 14 obsidian workshops Spence identify had a specific economic role supplying the inhabitants of Teotihuacan, the people of the Teotihuacan Valley, and sometimes parts of the Basin of Mexico.

Teotihuacan and other City-States:

After Spence wrote about the obsidian industry in Teotihuacan, Robert S. Santley (1984, 1985) looked at the obsidian assemblage and came up with Teotihuacan having a controlled state over the material and distributed across various region. Santley focused more on obsidian long-distance trade and the connections between Teotihuacan, Central Mexico, and the Gulf Coast

(primarily on the site of Matacapan in present day Veracruz, Mexico). Santley saw that with the population of Teotihuacan, it must have had an empirical/monopolizing control of the Pachuca obsidian source. Santley looked and compared at various sites in the Central Mexico, including Tula, and the Gulf Mexico and saw the rate of consumption of different types of obsidian being used at these sites (Santley, 1984). Even though there was a connection between Teotihuacan and Matacapan in the form of obsidian trade and exchange, only limited quantities of Pachuca obsidian were recovered at Matacapan (Santley et al., 1985:112). A reason for the limited amount of Pachuca obsidian at the Matacapan site is the distant from the source, as the site is further away from the obsidian source the site will received smaller quantity, and the fact that Matacapan receive obsidian from the Maya region (Stanley, 1983: 109). The low amount of Pachuca obsidian found at Matacapan shows the people not utilizing it at much as a tool as in Teotihuacan, since Matacapan has the Orizaba obsidian source nearby.

A reason Matacapan wanted the Pachuca obsidian could be the distinct green color and its association with the symbolic value it holds coming from Teotihuacan, the green-gold color, or Matacapan was a port and traded with certain parts of the Maya region. This shows a much different approach to the economic values of obsidian not used as a utilitarian function but adding a symbolic value. The two models mentioned beforehand of trade and exchange within the Basin of Mexico stem from the rise of many powerful centers in each distinctive period. My approach is different which focus on the symbolic value as opposed to just the economic value. How powerful centers gives off symbolic value instead of economic value is the centers association with ritual context. Whether that is depiction of sacrificing, sending Pachuca obsidian to other regions, or being reference as a part of the center. Other powerful centers that are later seen with strong association are Tula and Tenochtitlan. Tula utilized the Pachuca source after the

decline of Teotihuacan in the Epiclassic Period, and Tenochtitlan, whose power was at its height in the Late Post-Classic when it formed the Aztec Triple Alliance (Santley, 1984:43). This shows the importance of Pachuca obsidian because many large urban centers had a strong emphasis on the material.

Tlajinga 33:S3W1 and Issues with Obsidian Models:

John E. Clark (1986) commented on both Spence and Santley obsidian models in his is paper: *From Mountains to Molehills: A critical review of Teotihuacan's Obsidian Industry*. The paper was a response to methodological issues on identification of obsidian workshop sites and archaeological approaches to obsidian workshop and exchange networks. He wrote that the fabrication of the number of workshops and people focusing solely on obsidian production does not make sense. Clark went off the numbers Spence gave for workshops and craftsmen and used Santley's rate of consumption to figure the amount of obsidian people used in Teotihuacan. The result of these numbers that past archaeologists had written on obsidian in Teotihuacan Clark believes that the debitage from obsidian workshop would be create a large hill size of obsidian within the area of Teotihuacan, which Clark states that the number representation are high to begin with (Clark, 1986:69). The issue with this claim is that people would let a large hill of obsidian be made, but the people will try to dispose the material in a manner that will not affect the community. This even could go into recycling other obsidian debitage to make different type of tools or even be crushed into smaller pieces to use as other material. The people have knowledge of obsidian and would dispose the obsidian properly. The people of Teotihuacan would remove the obsidian properly instead of just leaving the obsidian debitage in a large pile. As people known, obsidian is one of the sharpest natural material in the world. Storey mentioned sweeping methods from other sites of the removal of unwanted material and compared it to

Tlajinga 33:S3W1 (Storey, 1985). Most likely the people took the debitage to break it down and used it for construction fill or buried it in a timely manner.

One of the criticisms Clark made was there had been no obsidian workshop found in Teotihuacan at the time. It was true that at the time Clark wrote this article, no obsidian workshop in Teotihuacan has been excavated. This is a different situation now since there is an obsidian workshop that was recently excavated and being analyze that focused on blade production. We can see how people interacted with the workshop and see how much obsidian was being consumed in the domestic level. Clark's minimal requirements of an obsidian workshop are: (1) demonstrating an "unusually large concentration of obsidian artifacts", and (2) demonstrating that the concentration represents manufacturing debris (Clark, 1986:30). A workshop is a place where craft specialist produces his goods, implying a social relationship between producer and consumers (Clark, 1986: 42). At the time, the models of trade and exchange reflected on large interaction between different regions of Mesoamerica, as seen with the focus on Teotihuacan economic role on large scale production of obsidian as seen with Spence, Santley, and Clark ideas. This shifted from the large-scale trade and exchange into focusing on the domestic economy of the city.

Shortly after both Spence and Santley articles, but before Clark article were presented, Glenn Storey completed his 1985 Master's thesis on the obsidian assemblage in the apartment compound, Tlajinga 33:S3W1. The site of Tlajinga 33:3W1 is in the southern outskirt of Teotihuacan in the Tlajinga district. This mound was a large apartment compound with multiple families living together. Tlajinga 33: S3W1 had multiple workshops that primarily focused on ceramics and lapidary. Even though no obsidian workshop was found at this site. After analyzing the obsidian assemblage, Storey believed that Tlajinga 33:S3W1 was not a site for obsidian

production, but a receiver site of obsidian that focus on its own residents (Storey, 1985). Large amount of obsidian was recovered and analyzed to understand the functional role of the obsidian assemblage. The obsidian was used for both household function and the craft production of ceramics and lapidary were being produced in Tlajinga 33:S3W1. The excavation brought good examples and explanation on the methodology for identifying what is needed for obsidian production. The site used screening to find small pieces of obsidian debitage to show the how much obsidian was at this residential complex. It also made the suggestions for future studies of obsidian in Teotihuacan to measure and weigh the blades to show the level of production and finding the consumption of obsidian in a site.

Workshop Identification:

Going off the methodology for obsidian workshop identification from Clark suggestion we will look at two sites that are proven to be obsidian workshops by the density of obsidian found in surface survey. The sites are Tula and Xochimalco that gives the most recent evidence of identifying an obsidian workshop. Both sites have already been confirmed as having obsidian workshops. Both sites are from the Epiclassic period and come after the decline of Teotihuacan. Tula is in present day Hidalgo, Mexico near the Pachuca obsidian source, gaining easy access to mine the obsidian, and Xochimalco is in present day Morelos, Mexico, which is south of Teotihuacan being much farther away from the Pachuca obsidian source. Tula was excavated and analyzed by Dan Healan, and Xochimalco was excavated and analyzed by Ken Hirth (Healan 1983; Hirth, 1995).

Each of the sites had large concentrations of obsidian during surface survey and once areas of high concentration of obsidian were found, test pits were dug to see if the concentration of obsidian situated in the area was consistent with the surface remains. After the test pits

excavated the results showing large obsidian density, excavation continued within the area, showing the area to be an obsidian workshop. This has proved to be the best method to find obsidian workshops, but the limitation of differencing between a primary and secondary trash deposits from using this method makes it difficult because it could be determined to be an apartment compound that has high concentration of obsidian (Hirth, 1995:252). In Tula, high surface concentration made it easy to find the workshop and once excavation started and finish, the site had 650 kg of obsidian with over 500,000 pieces of obsidian (Healan et. al., 1983: 136-138). In Xochimalco, 12 areas were believed to be location of obsidian workshops. In the findings of these workshops, it has shown the different levels of craft production Xochimalco had with domestic, precinct, and specialized obsidian workshops (Hirth, 1995).

Domestic Economy:

Besides the focus of long-distance exchange system, archaeologists shift their focus to household involvement in economy and created a new approach to the studies of economy and craft production in Mesoamerica. The domestic economy is where households organize to meet their physical and social needs (Hirth, 2009:13-15). The shift of economic anthropology/archaeology into the domestic household brought new economic ideas and the structure of distribution systems was needed for domestic economy in Mesoamerica, where much of the production came in small households in which any individual could produce their own crafts.

From my own experience of flintknapping, I do not believe it is hard for making the polyhedral cores, and apply pressure techniques to well-made polyhedral cores to get prismatic blades. I see the argument Clark made on the master/high skill level it takes to create the polyhedral core from a large cobble/nodule (Clark, 1986; Storey, 1985). Don E. Crabtree also

commented when he experimented on making polyhedral cores and prismatic blades, on the difficult of making polyhedral cores (Crabtree, 1968). The claim of only master/high skill level knappers to make obsidian cores and blades people do not take into consideration the years and the age of the people of Teotihuacan learning flintknapping techniques (Widmer, personal communication). Domestic economy in Mesoamerica needs to be looked at in a strategic manner, focusing on the domestic craft production instead of the amount of time that was spent on elite structures causing a diversification in craft production (Hirth, 2009:14). The domestic context is important because of the focus on the common people, which is the majority of people. In the domestic household, you will have an artisan who will be making items for themselves and a few households.

In the household, it emphasizes how the common people played a role in the economy of the city. Focusing on domestic production instead of large scale production allowed a time when the individual would need the material (obsidian) and be able to work whenever allowing time for other activities (Hirth, 2009:23). Understanding this concept can be a helpful strategy because of the risk involved. A risk that would be involve is gathering the material for the domestic household by venturing into unknown territory. This is a great risk since it could lead to many dangerous situations and the fact that one individual would be only be able to carry a small amount of obsidian at a time. This is different if someone is gathering the material at the local workshop or market area since exchange would be needed to get the material to produce the items that are needed for the homestead. With less of a risk to be taken, the household would have the importance of their health and survival. In the past archaeologists focus on the distribution of obsidian in the Basin of Mexico and Mesoamerica in a large-scale network, but

now it has shifted into an individualistic domestic approach that shows how common people fuel the economy.

Tlajinga 17:S3E1

In the most recent excavation that has been done in Teotihuacan was the *Projyecto Arqueologico Tlajinga Teotihuacan* (PATT) by David Carballo and Luis Barba Pingarron. The focus of the project was in the Tlajinga district, a neighborhood in the southern section of Teotihuacan where the inhabitants are of lower socioeconomic stratum, with the goal of understanding the urban growth of both household and urbanization of the city through the central civic planning and neighborhoods, and the domestic economy of the people in Tlajinga district (Carballo, 2013). The project started in 2013 and continue for a few years with excavation nearly completed and analysis of artifacts still being conducted as of 2017. What the project found was very astonishing: the first domestic obsidian workshop that specialized in the production of prismatic blades at Tlajinga 17:S3E1 with 33, 927 pieces of obsidian weighing at 415 kg and excavated in only 66 square meters (Carballo and Hirth, 2013: 95; Carballo, personal communication). As to my knowledge there has only been two obsidian workshops that have been excavated in Teotihuacan: (1) The obsidian workshop that is located next to the Moon Pyramid, and (2) Tlajinga 17:S3E1, the most recent obsidian workshop found; both excavated by David Carballo (Carballo, personal communication). With the amount of obsidian deposits found during the field season of 2013, it brings clear information on the obsidian production Teotihuacan had. When looking at the results of the two sites with obsidian workshops mention in the workshop identification section. David Carballo and his colleague's confirmation are right for Tlajinga 17:S3E1 being an obsidian workshop, but it should be noted that this workshop follows Spence regional workshop requirements since it is specialized in blade production and

near large public structures or area. The Tlajinga District had 4 temples platforms forming cruciform patterns functioning as the religious center for ceremonies with one of the temples across the Avenue of the Dead from the Tlajinga 17:S3E1 obsidian workshop (Widmer and Storey, 2012:110).

The excavation also showed interesting finds with obsidian artifacts. Two Features during the 2013 season that were excavated had obsidian cores being buried with other artifacts and other material. In Feature 1 from Figure 2.4, a cache offering of 10 obsidian cores of various sizes that are ready for blade production being buried on top of human remains (Carballo and Pingarron 2013:51-52). In Feature 5, Carballo and his colleagues uncovered 18 large cores, a mix primarily of macrocores with very few fine pressure cores see in Figure 2.5 and 2.6 (Carballo et. al., 2014: 55-57; Carballo, personal communication). It seems the people of Tlajinga 17: S3E1 offered obsidian cores as a ritual cache offering since this is what the people in Tlajinga 17: S3E1 had the most or could be hiding large amount of obsidian cores to not be taxed by the city (Carballo, personal communication; Widmer, personal communication). This shows the importance of domestic economy in Teotihuacan and what still needs to be excavated at the city to further understand how the inhabitants lived. With these different approaches and including the symbolic value on obsidian instead of solely looking at it as a basic functional tool.

Symbolic Approach:

We already know the importance of obsidian as a material to make tools, but not as much has been said about the symbolic aspects obsidian held in Mesoamerica culture. Many Mesoamerican archaeologists center on the economy of raw material acquisition and lithic technology, but at times the models of acquiring the material are oversimplified and not looking at the human aspect of gathering the material (Carballo, 2005:76-77). In Mesoamerica, temple

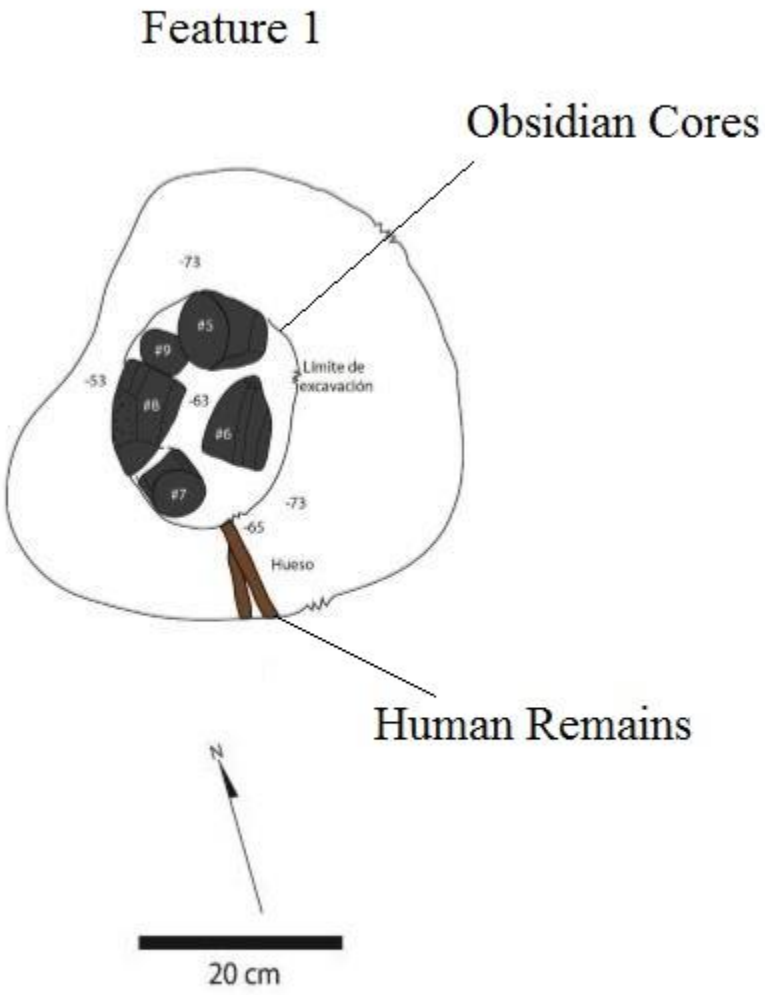

Figure 2.4 Tlajinga 17:S3E1 Feature 1 Cache Offering (Adapted from Carballo and Pingarron, 2013:53)

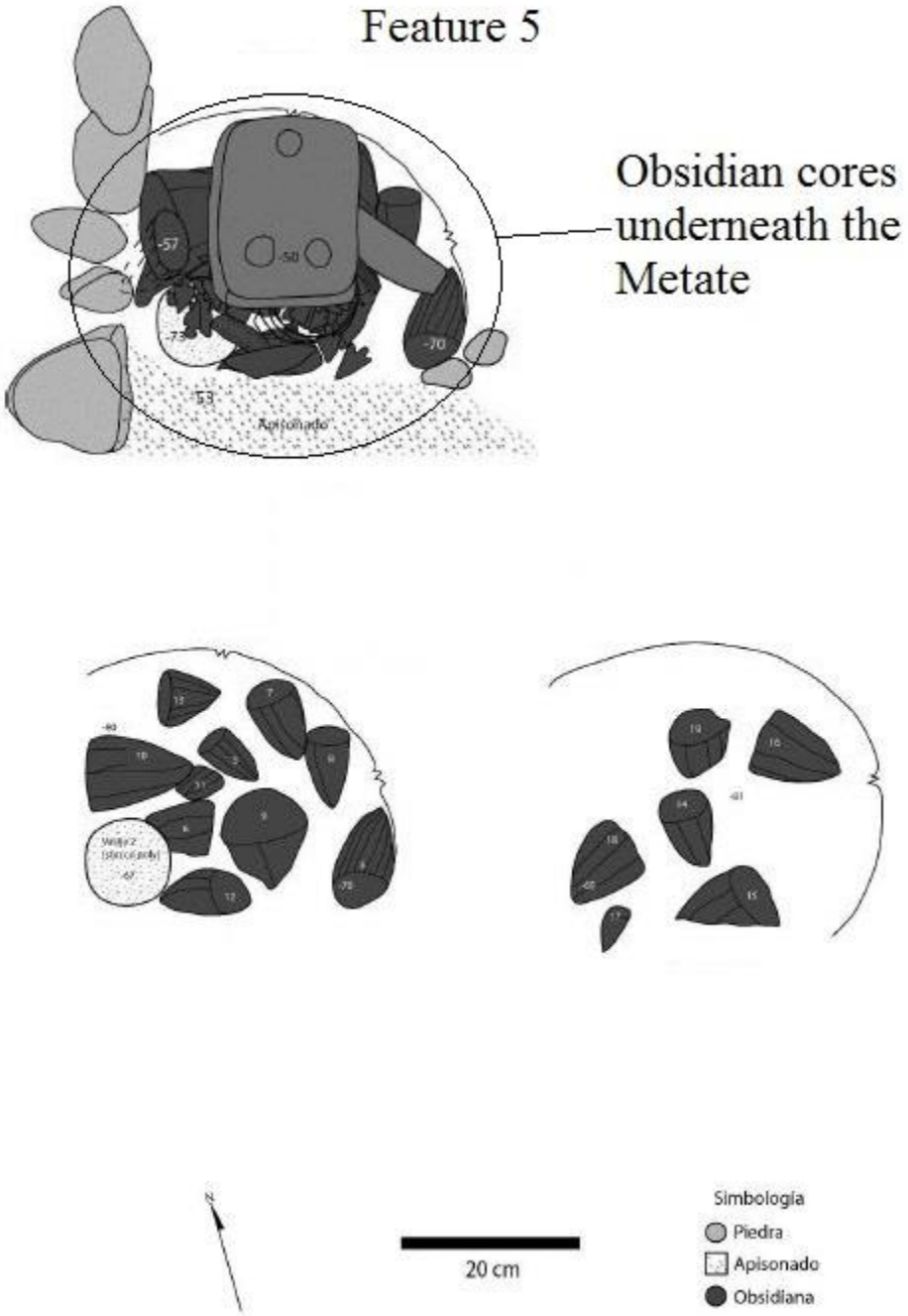

Figure 2.5 Obsidian cores cache offerings from Tlajinga 17:S3E1 Feature 5 (Adapted from Carballo and Pingarron, 2013:58)

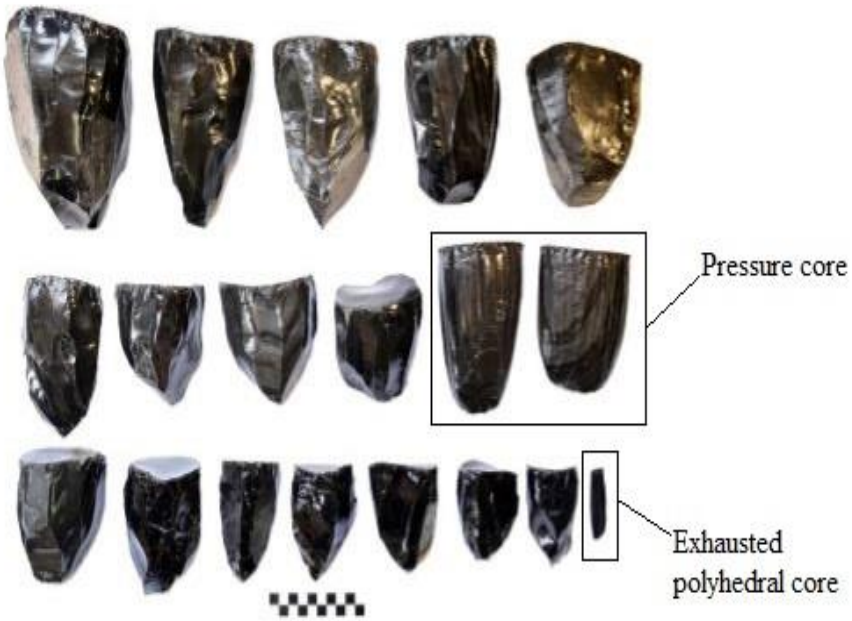

Figure 2.6 Mixture of macro, pressure, and exhausted cores from Tlajinga 17:S3E1 (Adapted from Carballo and Pingarron, 2013:96)

offering was a common practice with people holding ceremonies and offered ritual materials. In the Pyramid of the Moon at Teotihuacan, there is evidence of offering during all construction of the pyramid. The offerings ranged from animals, ceramics, human sacrifice, jewelry, and obsidian. Obsidian could be valued for many reasons, as stated by Carballo "from particular obsidian quarries because of its physical attributes, such as color, translucence, or homogeneity together with social attributes, such as its rarity within a certain region or its association with a powerful cultural center" (Carballo, 2014:196). Pachuca obsidian is the obsidian that has the strongest association with a powerful center, as seen in Teotihuacan. Blades and other obsidian artifacts can be found in other sites in Mesoamerica, like in the La Laguna site, where offerings were made to a temple (Carballo, 2015), and Pachuca obsidian has been found as far south as the Copan valley in the Maya region in the form of gifts of commodities to build social relationships with the representative of the settlement (Aoyama, 2015; Spence, 1996:34). Even though Pachuca obsidian has been found that far south, little is shown in the archaeological record. This could indicate the rarity of Pachuca obsidian in the Maya area and the creation of relationships with Central Mexico. Pachuca obsidian being found so far south reflects the connection between the Maya region and Basin of Mexico.

All the powerful centers through time in Central Mexico has shown strong interest in the Pachuca obsidian, and seeing an abundance of the material and giving it a significant value. (Ponomarenko, 2003:88). The dependence on obsidian, primarily on Pachuca obsidian does give it significant value in Mesoamerica cultures. Obsidian points, figurines, and blades have been used as offerings to numerous temples as mention with the offerings at the Pyramid of the Moon and the Feather Serpent Pyramid in Teotihuacan. The bloodletting and sacrifice of victims are done during important ritual dates and the importance of obsidian used for making the incision

on the body. The offerings in burials context once a deceased person passed away can also show the person being associated with passing through the underworld. The issue for sacrifice is finding evidence of sacrificial events on tools. Blood residue analysis is needed to see if any kind of sacrifice occurred, but obsidian would make the incision the easiest due to its cutting ability. Much of the iconography with obsidian is found during the Post-Classic period, but a little can be interpreted in the Classic Period. This does make it difficult to see iconography of obsidian in the Classic period, but referencing the Late Post-Classic and Colonial period can help in the interpretation because of the ethnohistory from Spaniards written account. The best way to look at the symbolism of obsidian would be from the temple offerings and, even more so, in the burial goods that are found in the apartment compounds of Teotihuacan.

Summary:

Different models have been created to give examples of trade and exchange in Mesoamerica. These models present how material were manufactured, the material distribution, and social interaction resulting from material exchange. Seeing the obsidian industry in Teotihuacan over the decades it has been studied reflects on our understanding how the economy was in the city. By asking question like was the raw material worked at an obsidian quarry and transported to a site? Where the finished product was distributed throughout the settlement, or was some work done at the source site only to be finished in the city and later moved out of the city? Even though we have ideas on the concept of trade and exchange of obsidian in Teotihuacan, it seems that we still need to put the humanistic approach to understand the behavior function. Merging a symbolic point of view can lead to new approaches of trade and exchange of obsidian. Distribution models for the flow of obsidian and other materials can change, so how do these systems operate or function, and why distribution systems change or

evolve (Earle and Ericson, 1997:10)? Did Teotihuacan exchange system change from the start of the urban center until establishing large structures? Was there no or minor change until its abandonment around the 6th or 7th century? These questions are what archaeologists are trying to understand prehistoric exchange systems. Even to this day studies are still being conducted around Teotihuacan and Mesoamerica in their socioeconomic rise to large complex societies.

Chapter 3: Methodology

What I expect to find in doing my thesis research is seeing the importance of trade and exchange with obsidian, not only looking at obsidian as a utilitarian object, but also as a symbolic object. An object that people wanted and would travel and interacted with each other to acquire this material. Which is important to understand since it will show an idea on how Pachuca obsidian was value and give a different understanding of socioeconomic of the Basin of Mexico. Obsidian is one of the most common material found in the Basin of Mexico, so it was heavily utilized for thousands of years, but why not other stone material for the same function as obsidian. Even though obsidian tools had a minimal use until it becomes dull. This is especially true for prismatic blades that will only be sharp for a few times depending on the job it was doing. This is the important of understanding of trade and exchange models to incorporate not just the function of the material, but the value of the material the local inhabitants has on the material.

The results of my findings for this thesis topic could show a new approach with the current intraregional models of distribution for obsidian in Teotihuacan. In showing the new data that has been presented for Tlajinga 17:S3E1 and 18:S3E1 by following the intraregional model as closely as possible with identifiable nodes for each site. Just as Clark stated their needs to be new identification for technological difference in obsidian and determining if it is truly a workshop as the obsidian material is arriving from quarry site into Teotihuacan. After a craftsman in Teotihuacan as worked on the raw or semi-raw material it is going to be recycled into the market system, and eventually back to the inhabitants of the city. Where much of the rural communities would come into the market of Teotihuacan and be dealing in smaller quantities of the obsidian with lesser quality (either as cores or prismatic blades). Much is still

needed to be researched in Mesoamerica with a different outlook at how the people in the prehispanic era interacted with each other and form relationships. The evolution of socioeconomics is still something archaeologists and I want to know and it could give a reason to look at other materials that are preserved on the archaeological record with symbolic value. I would like to further continue this topic of research, and hope to learn a great deal upon it and further expand the knowledge of evolution of complex societies in Mesoamerica.

The specific problem I want to answer for my thesis paper is how Pachuca obsidian was being obtain in rural and urban areas through a form of trade and exchange or market system emphasizing in an intraregional model in the Teotihuacan Valley during the Classic period. I would not need to have a chemical analysis of obsidian since I am only looking at the Pachuca obsidian. Teotihuacan was the main site that will be looked at due to the amount of data and research on it that has been presented over the decades. Teotihuacan will be the hub of the Teotihuacan Valley, where much of its resource origins are only a day or two away. This makes Teotihuacan a prime location for a starting point in the intraregional model. Instead of looking at different types of obsidian, I will focus only on Pachuca obsidian because of its large pool of data, information that has been presented over the decades, and because it was preferred for blade production. Another reason is the Otumba obsidian was favored for making bifaces, unifaces, and hafted bifaces due to Otumba obsidian being sturdier. Also hafted bifaces were more inclined for weapon and military purpose instead of solely as a domestic tool function. Teotihuacan had a large and dense the population which would have needed an economy to sustain itself and connection to the rural villages that surrounded the city. The interaction each community had for a network relationship was necessary to generate the necessary sustainability. With a large city, markets had an important function within the Mesoamerican society: they

supplied and brought the product (semi-finished or finished) that could be accessed by anyone, controlled the distribution flows of the craft and service, and scheduled the labor and time to gather and finish the product (Hirth, 1998:452). These are some important ideas to consider in the distribution of craft in a communal setting. I would like to state that I did not participate in any of the recent excavation or lab analysis on the new sites since time and cost were against me for my thesis.

The data that I will be using will be from the data analysis reports from the Teotihuacan Valley project, Tlajinga 33:S3W1, and *Projyecto Arqueologico Tlajinga Teotihuacan* (PATT). The 8 archaeological sites I am going to use are a mixture of urban and rural sites (See Figure 3.1) starting with the sites in the city: Teotihuacan Tlajinga district (See Figure 3.2) of Tlajinga 33:S3W1, Tlajinga 17:S3E1, and Tlajinga 18:S3E1. My rural data are from the Teotihuacan Valley: Maquixco Bajo TC-8, Mixcuyo TC-5, Tlaltenco TC-46, Tenango TC-49, and Xometla TC-21. I should make note that Tlajinga 17: S3E1 will be used as mainly reference because the focus is on obsidian consumption with little emphasis on obsidian production. Maquixco Bajo TC-8 (Middle Horizon site) Mixcuyo TC-5, Tlaltenco TC-46, and Tenango TC-49 are set in the Early and Middle Classic period. Xometla TC-21 occupation is in the Late Classic period at the time when Teotihuacan was declining. The reason these sites are chosen because they are situated outside the urban center, Teotihuacan. In the model that will be presented they will be in the outside nodes of the large center. Only a few of these rural sites had large excavations of mounds found during survey. Maquixco Bajo TC-8 had four mounds excavated, Tlaltenco TC-46 had two mounds, and Xomelta TC-21 had one mound. Mixcuyo TC-5 and Tenango TC-49 had small trench excavation around certain structures.

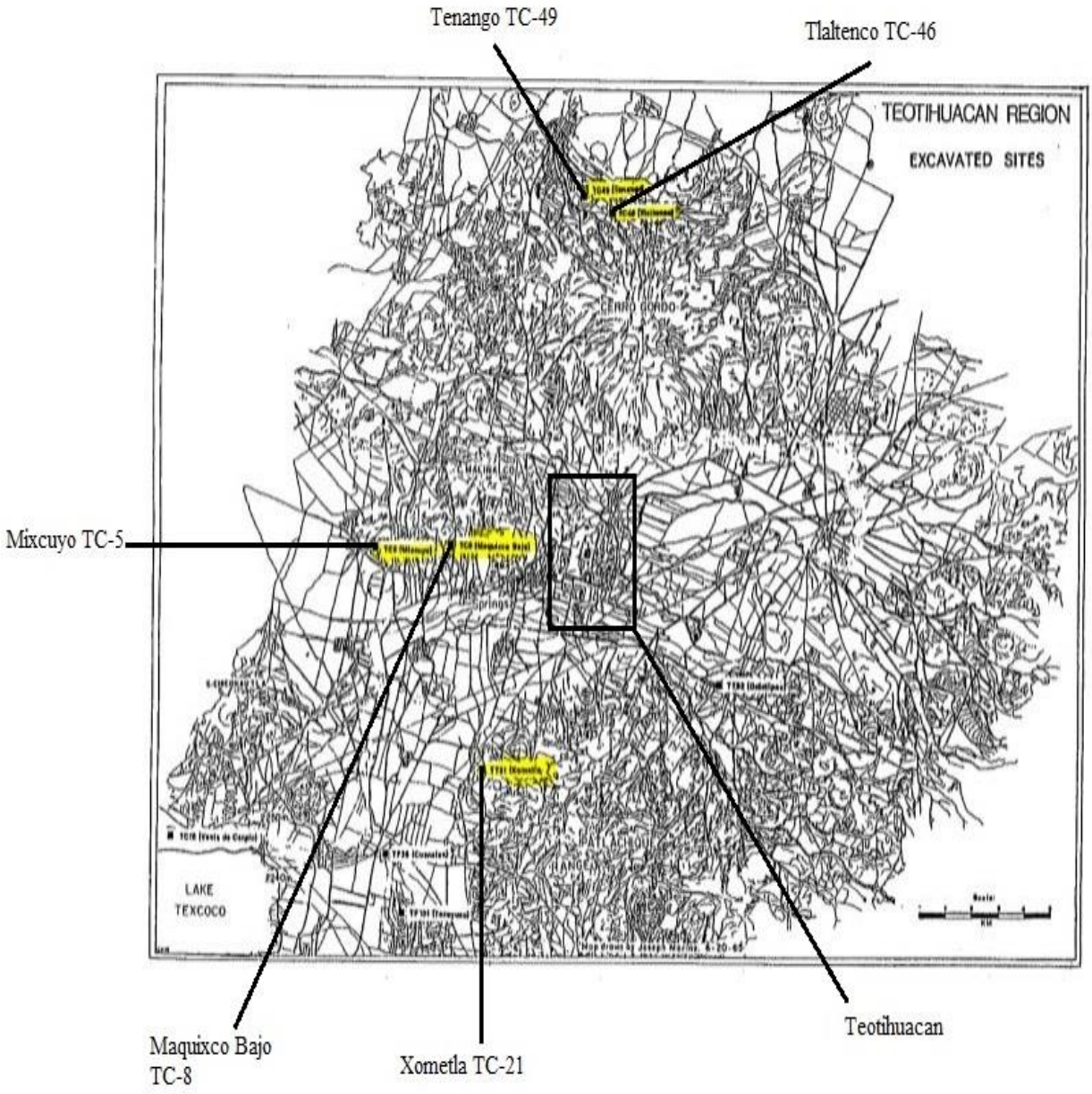

Figure 3.1 Teotihuacan Region Map (Adapted from Sanders, 1994:9)

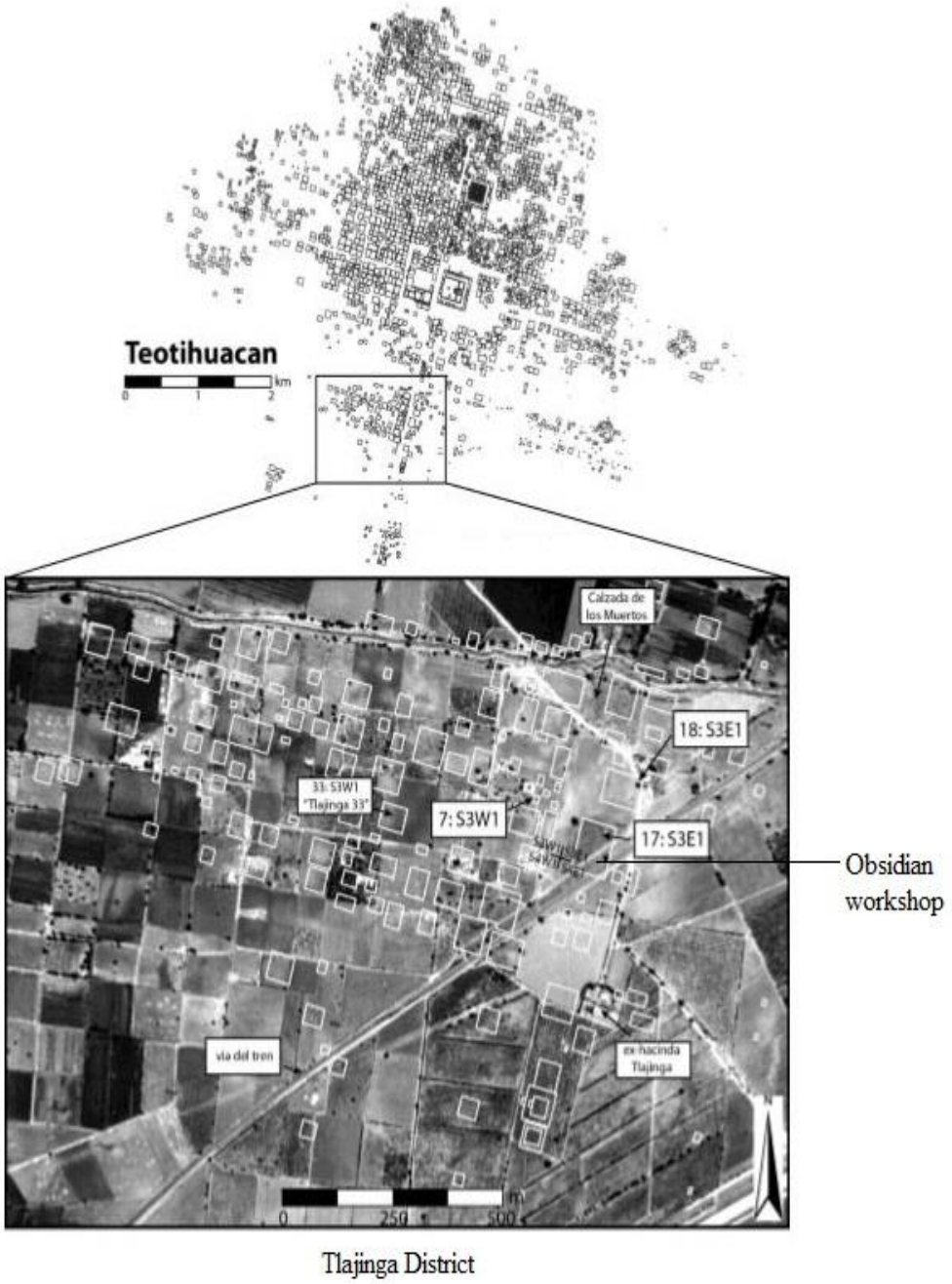

Figure 3.2 Tlajinga District (Adapted from Carballo and Barba Pingarron, 2013:4)

As mentioned before the sites that are in the city are the apartment compounds Tlajinga 33:S3W1, 17:S3E1, and 18:S3E1 on the data analysis on the obsidian assemblage in the southern outskirts of Teotihuacan. Tlajinga 33:S3W1 obsidian assemblage data was presented in Glenn Storey's 1985 master thesis. Tlajinga 17:S3E1 and 18:S3E1 (apartment compounds) are in the same district as Tlajinga 33:S3W1, but East, across the Avenue of the Dead. Excavations and data analysis are still be conducting and finalizing on Tlajinga 17:S3E1 and 18:S3E1, but the site has yielded enticing findings on obsidian (and in general good archaeological context of other materials). It is clear Tlajinga 17:S3E1 is an obsidian workshop, due to the large amount of obsidian cores, series of blades and other resources found (Carballo, personal communication). Tlajinga 17:S3E1 is the first domestic obsidian workshop that has been excavated in Teotihuacan. Incorporating this site within the model will give a much clearer idea of networking for distribution, and seeing the relations each site had with each other through the archaeological record during the Classic period.

As I briefly wrote about Widmer's (1996) intraregional model in the beginning, I will give distinct possible location that the nodes will be. With the first three nodes meant for storing and transportation of the material with the first node being the Pachuca obsidian quarry site. The Pachuca obsidian quarry is in Hidalgo, Mexico, 50 kilometers North from Teotihuacan. It seems that much of the craft production around the quarry was preparation of obsidian macrocores from the small amount of surface survey done by Holmes (1900) and further analysis from Charlton (1978). These are the most common found material around the source with few other obsidian artifacts. Bifaces and scrapers were also being prepared around the quarry site. It is a rare find, but prismatic blades, polyhedral, and exhausted polyhedral cores are also found around the area (Charlton, 1978). Much of the area still has not been excavated, however, so the Pachuca

obsidian quarry site could still hold sites that have not been discovered and excavated, but due to deforestation and erosion, it is becoming difficult to finding archaeological sites. Most of what has been found usually is associated around the Late Post-Classic period, but there is countless evidence of Pachuca obsidian being used as far back in the Formative period showing the exploitation of this kind of obsidian. Further research still needs to be conducted, but I do believe small villages around the area were mining and preparing obsidian cobbles/blocks for transportation to other archaeological sites. The second node is the holding/preparation/transportation of obsidian that will be shipped to Teotihuacan. The many hamlets and small village in that area is where the obsidian cores would be stored. Charlton (1978) talked about the obsidian exploitation in the Tepeapulco area with the Tepeapulco site having an obsidian workshop to prepare the cores for mass shipment. A reason for this is that, due to the natural corridors that the Basin of Mexico has, it is easy to move in and out of the area without passing over large mountain ranges.

The third node is on the edge of the city, where the obsidian would be in storage to be sold to the market or to vendors. There is no site that corresponds to this in Teotihuacan, but if the area was meant for storage then little or no signed of manufacture of obsidian would be found since the purpose of the location is storage. The only evidence I can see for this is other large amount of other resources found together. The fourth node would be of the market area where vendors will sell the worked obsidian core within the city. This would be the same idea as the third node because a full market area has not been excavated. Even if one was excavated the density of obsidian would be considered low because the objective of the market is to sell the material. The fifth node is represented as the site where consumer would work on the obsidian

core. The site that represent this node is Tlajinga 17:S3E1, since this is a known obsidian workshop that has been excavated in the most recent time.

The sixth node is the recycling part of the model with the intention of bringing the finished obsidian material back to the market to be sold to inhabitants of residential compound. The seventh node is the end of the model where the consumer can bring semi or finished obsidian product to their homes. A site that fits into this node is Tlajinga 33:S3W1, a receiver site, as stated by Storey in his Master thesis. I will further add onto Randolph J. Widmer's model in his article (Widmer, 1996) by adding another node to explain Pachuca obsidian leaving Teotihuacan into the rural sites, the eight node, will be consider for the trade and exchange between small rural sites to the city. A site that is consider for this node is Maquixco Bajo TC-8, since this site is not far from Teotihuacan, but only a few kilometers west.

I will also incorporate another model from a different site in Mesoamerica, Tula in Hidalgo, Mexico, because it is known to have obsidian workshops for both local and non-local consumption. The intraregional model presented at the site of Tula by Dan Healan will be used to see how it will hold up for Teotihuacan. The local model that Healan explained for Tula obsidian exchange states that with the low production volume and low unit of value of obsidian blades being produced, then the state would be less controlled and taxation would not be in force (Healan, 1993: 457). The obsidian assemblage at Tula showed private sectors that would handle all the details of their undertaking. It seems that many of the workshops that existed in Tula were done in the household making it the place where the general family of the apartment compound consume the material (Healan, 1993:457). The best way for Tula urban and rural areas to acquire obsidian would be from the marketplace. It is also a possible in the marketplace for vendors to be making blades to attract consumers. With the size of Teotihuacan, one large or small multiple

markets in open areas would help the distribution of obsidian blade core technology and other material.

What will help with these models is the data that David Carballo (2013) presented in his article that took the distance and travel time it will take from Teotihuacan to a resource site (obsidian quarry) to acquire the necessary resource (obsidian). Transportation cost in Mesoamerica were high because of the terrain of Central Mexico and the lack of animal power, which forced locals to rely on heavily on humans (Carballo, 2013:118). The data for the traveling to the resource areas area from a combination of the ASTER and SRTM data with both using Tobler (1993) hiker-function for least cost-path (Carballo, 2013:120-121). With this type of data, the distance with estimated travel time could better determine how much obsidian would be coming into Teotihuacan, then the standard consumption rate model. The consumption rate model only deals with the amount of obsidian being consumed by the amount of people in the site and not adding any information about the distance needed to travel to acquire obsidian. From the calculation Carballo used to determine the distance (measured in hours) it would take from Teotihuacan to the Pachuca quarry: (1) travel time (4km/hr) would take 13.3, (2) path cost SRTM would take 11.6, and (3) path cost ASTER 17.4. By adding all three of these estimated times, you get an average of 14.1 hours of walking from Teotihuacan to the Pachuca source in Hidalgo at a speed of 4km per hour. I would say a person would take no more than two to four days to travel the 50 kilometers distance. This also intakes the amount an individual could bring back if obsidian blocks or cobbles weigh a max of 5 kilograms. With the model that was presented earlier, would time be a factor? No, since interaction between Teotihuacan and the smaller villages towards the Pachuca obsidian quarry site could break down the interval between each settlement causing a trickle of Pachuca obsidian to come in a steady flow.

Besides using the data analysis reports that were conducted for these archaeological sites in Teotihuacan and the Teotihuacan Valley, I will also use literature from scholars who have written about the symbolic importance in Teotihuacan with murals of obsidian being the focus. Using imagery of key depiction on obsidian or resemblance of obsidian like quality to show the importance of obsidian material for the people of Teotihuacan. The importance of merging the symbolic approach of obsidian and the economic ideas into an anthropological/archaeological approach would show a greater emphasis on people's perceptive on obsidian. This would help set up the model of exchange for obsidian instead of the normal view of just a utilitarian outlook, but incorporate why the people of Mesoamerica saw obsidian as having symbolic value.

I am going to answer the idea of the intraregional model of obsidian in the Basin of Mexico by looking at measurements that have been taken from the data analysis report of the mentioned sites. The measurements will come from prismatic blades measuring the length, width, thickness, and weight of the prismatic blades. Any mention of blades being segmented will be also looked at because you get two or more tools instead of just one. If the blades are segmented into three sections, then the most desirable part of the blades is the medial section. The reason for this is the medial section will give the most edges to be used compare to the proximal or distal section (Widmer, personal communication). Teotihuacan would have more of the medial section of the blades compared to the rural sites in the Teotihuacan Valley. If there are fewer medial blades outside of Teotihuacan then it will show the value was placed on this section of the blade. The outcome of this idea shows the size of the blades, if the blades are small the further away from Teotihuacan then it means the rural sites received the discard part of the obsidian or received less amount of obsidian because of the socioeconomic differences from

rural and urban living. The reflection on obsidian distribution would show the socioeconomic status of each site had during the Classic period.

As stated in Chapter 1, the majority of iconography regarding obsidian is seen during the Post-Classic period and Colonial period. In the Pre-Classic period iconography hardly existed with obsidian. Writing did not have prolific usage during the Classic period in the Basin of Mexico. Rather iconography and other forms of art styles are used to give some insight into the lives of the people in the Basin of Mexico. The depiction of obsidian in Teotihuacan can be seen in the darts on the atlatl, a weapon that Teotihuacan was known for, and curved obsidian blades associated with ceremonies and sacrifices (Headrick, 2007:79). This shows the people of Teotihuacan saw obsidian blades as both in a functional purpose and symbolic meaning with being shown has a tool and an item for religion purpose. One of the key deities in Teotihuacan that has been studied through the iconography was the Storm god, Tlaloc, or a possible predecessor, being associated with obsidian. The appearance of the obsidian in the Basin of Mexico was caused by the Storm god holding a curved atlatl and its mythos of lighting hitting the ground causing obsidian to appear, as seen in Figure 3.3. (Headrick, 2007:127; Sahagun, 1950-1982:I:7). This even gives us an indication about what value the people gave certain materials or if these materials have a symbolic purpose. Depiction of gods and goddesses are associated with certain material or specific attributes because of the cosmology belief of Mesoamerican people, who incorporated higher beings into earthly material and the creation of the world and humans. Mesoamerican culture had a strong cosmology and symbolic connection with the natural world and blood, believing that the gods created the people of the land by sacrificing their own blood, and the people believed to recompense the gods by giving their own blood.

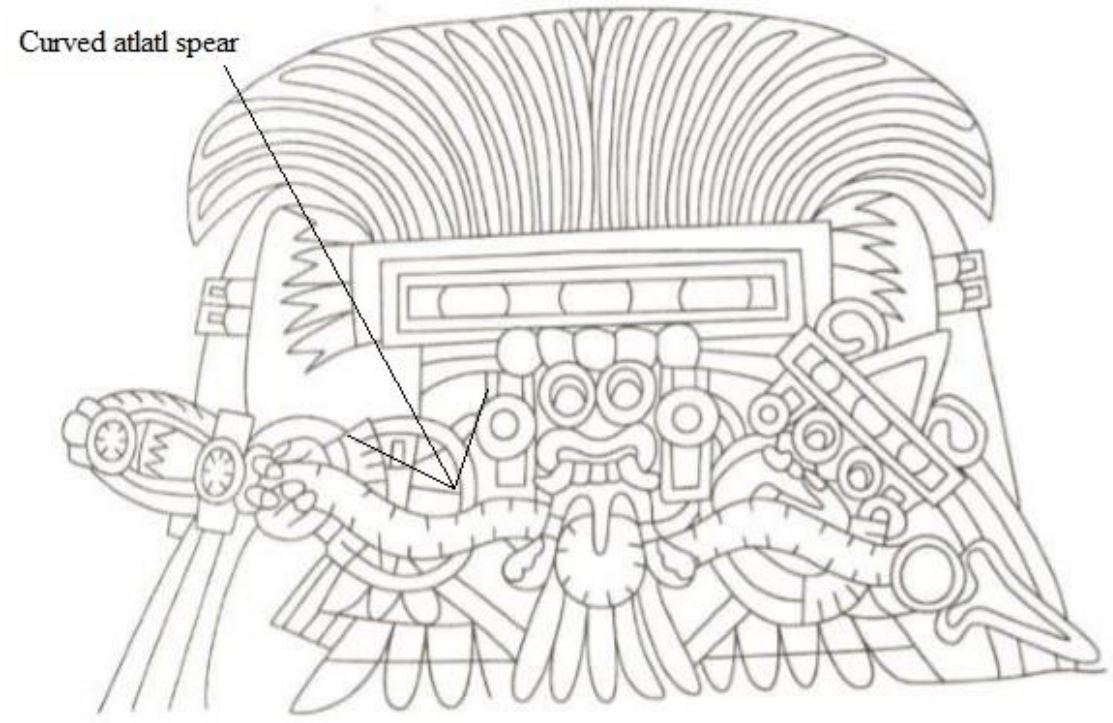

Figure 3.3 Storm God with curved atlatl spear (Adapted from Headrick, 2007:127)

Summary:

Introducing each site that will be used to answer the questions for my thesis research to have understand Teotihuacan obsidian trade and exchange. With both rural and urban sites data in the Teotihuacan Valley and using the two intraregional models to see how Pachuca obsidian was being distributed. Not only will the economic value be looked at, but the symbolic value of Pachuca obsidian needs to be consider a reason people would acquire this type of obsidian. In looking at both intraregional models to see how the interaction between Teotihuacan and the rural sites. These models could be a clarity on the influence Teotihuacan had within the Teotihuacan Valley and possibly the Basin of Mexico and other Mesoamerican sites.

Chapter 4: Data

The data that I will present for my thesis research consists the amount of obsidian prismatic blades and obsidian cores recovered at each site by looking at the percentage of Pachuca obsidian and Otumba obsidian, distance from Teotihuacan, state of reduction, socioeconomic status, and symbolic usage of obsidian from Teotihuacan. Much of the data comes from Glenn Storey 1985 Master thesis, the data report of the Teotihuacan Valley Final report and PATT (*Projyecto Arqueologico Tlajinga Teotihuacan*). From the analysis of the report the obsidian assemblage for all sites consists of Pachuca and Otumba obsidian, since these are the two most common type of obsidian used within these sites. Of the eight archaeological sites, three are in the city of Teotihuacan, and the remaining five are outside the city in the Teotihuacan Valley. Much of the large data set comes from the Tlajinga sites, while the five rural sites only consist of a small sample size except for Maquixco Bajo TC-8, who has a large data pool.

Maquixco Bajo TC-8 should be used as a comparison of socioeconomic status of wealth in rural areas. The reason for this is that Maquixco Bajo TC-8 is the only site with similar architecture and building material to what was commonly found in Teotihuacan. By referencing Maquixco Bajo TC-8's larger data set, it will help understand how the rural sites interactive during Teotihuacan (BCE 100-650 CE). The reason for the different data size of the rural sites is Maquixco Bajo TC-8 was one of the only fully excavated sites compared to the four rural sites that only had trench excavations, small excavations, and small test pits.

An issue that I have come across the data set is the lack of measurements (length, width, and thickness) of obsidian blades and cores. The only reference I came across for measurements was for Tlajinga 33:S3W1, which noted the average width being 12 mm (Storey 1985). This is

not sufficient to test some of my hypotheses. The importance of blade measurements can let us know the size of blades and the further the blades from the production area the smaller the blades become. This is primarily important with width because the smaller the diameter of the obsidian core, the narrower the blade will be. Measurements will be different for each blade because the force and position of the pressure tool will result in different sizes of obsidian blades. The weight of the obsidian blades and cores only comes from Santley's (1985) article that uses a cumulative weight of each obsidian artifact that has been categorized from the five rural sites and separated between Pachuca and Otumba obsidian. Even though the measure of the weight is cumulative of each obsidian artifact and not the average weight of each individual artifact, it will help show the size of the obsidian core and blades in each of the rural site. The average will be conducted by simple conversion by dividing the total weight by the number of obsidian artifacts in the prismatic blades and obsidian core category to get the average weight of each rural site.

Another issue I came across in the obsidian data set comes from Tlajinga 17:S3E1 and 18:S3E1 as both sites used percentage of obsidian artifacts instead of whole numbers of obsidian artifacts. The only whole number that is shown in the data analysis report is the total lithic assemblage. What I intend to do with this issue is take the percentage of obsidian from the total assemblage and multiple to the total assemblage to make the assemblage only consist of obsidian. Once I get the total obsidian assemblage, I follow the same process as before, but focus on the percentage of prismatic blades and core category to get whole numbers. This will give a rough estimate of the number of obsidian artifacts that were found at Tlajinga 17:S3E1 and 18:S3E1. Following up on more issue with the data set is the percentage difference between Pachuca and Otumba obsidian in Tlajinga 18:S3E1 only Tlajinga 17:S3E1 has the percentage between Pachuca and Otumba obsidian. After talking to Dr. Widmer about the problem I came

across, we decided that it would be best to set Tlajinga 18:S3E1 Pachuca obsidian percentage at 90% since it would be higher than Tlajinga 33:S3W1. The idea stems from Widmer analysis of soil sample from the site and visually identifying that the obsidian from the soil sample to be 100% from the Pachuca source (Widmer, personal communication). This would also go with the statement that Storey made that an obsidian blade workshop should be over 90% being Pachuca obsidian since obsidian blade workshops will have high percentage of Pachuca obsidian for blade production (Storey 1985). This is shown in Tlajinga 17:S3E1, whose obsidian workshop has slightly over 95% of the obsidian assemblage being Pachuca obsidian.

Many factors of these issues come from how methods of recover and analysis of the obsidian. With the measurements, it comes down to not being the top priority in the Teotihuacan Valley Final Report and the obsidian data of both Tlajinga 17:S3E1 and 18:S3E1 are still being analyzed by Carballo and his colleagues (Carballo, personal communication). I will start with the obsidian assemblage in the Tlajinga district since the base of the intraregional model is focused on the inside of the city with the connection to the rural area. Any reference to the data that I am looking at is combined on a single table for easy and quick access (See Table 5.1).

Urban Data Set

In the Tlajinga 33:S3W1 (Figure 4.1) obsidian assemblage, of the 24,375 obsidian artifacts, 20,529 was made from Pachuca obsidian and 3,846 were made from Otumba obsidian. This already shows the preference of Pachuca obsidian that is found in this apartment compound with obsidian blades being the highest artifacts category found. Large number of obsidian polyhedral cores were found with the same result of Pachuca obsidian being favored compared to Otumba obsidian. From the 199 obsidian polyhedral cores, 174 were made from Pachuca obsidian and 27 were made from Otumba obsidian. Obsidian blade fragment was commonly

found in Tlajinga 33:S3W1 and Storey estimated from only 55% of the site excavated to yield 5,136 whole blades and adding the remaining 45% of the unexcavated site yields 7,447 for the entire site (Storey 1985). The average blade width at Tlajinga 33:S3W1 is 12 mm and Storey makes reference that this is narrower compared to the average width of 15-20 mm that are found in the southern section of Mesoamerica and Sollberger and Patterson replication of prismatic blades averaging 14-15mm (Storey, 1985:4; Sollberger and Patterson, 1972:572). Tlajinga 33:S3W1 did not having any weight data set I could access, so weight will only be discussed in the rural sites presented in Santley (1985) article.

Tlajinga 17:S3E1 (Figure 4.2) is one of the most recently excavated sites in Teotihuacan Tlajinga district. This site is on the eastern side of the Avenue of the Dead and only a few meters away from Tlajinga 33:S3E1. Tlajinga 17:S3E1 obsidian assemblage is much different from Tlajinga 33:S3W1 because the density and amount of obsidian found in the site is far greater and as first suggested by Spence (1987) to be an obsidian workshop. The obsidian workshop specialized in blade production and this is seen in the obsidian debitage that was recovered from excavation. The total obsidian artifact count is 33,435 and was separated into a total of six different artifact categories. The difference between Tlajinga 33:S3W1 and Tlajinga 17:S3E1 is 9,060 obsidian artifacts. With both sites only being a short walking distance from each other, one would think they would have similar obsidian counts and artifacts, but this is not the case. From the total 33,924 lithic material, 74.73% were categorized as pressure blades, making this the most common obsidian artifact type found in Tlajinga 17:S3E1 compared to both Tlajinga 33:S3W1 and 18:S3E1 that have a higher count of biface and uniface obsidian artifacts.

The pressure blade (Navajas de percusion) category is only made from obsidian since obsidian will give a better sharp edge then other stone material. The whole number for the

pressure blade category is roughly 24,986, but the focus on this site will be prismatic blades (Tercera serie, prismatic) and core formation (Formacion de Nucleo de Navajas) categories. The total percentage of core formation is 9.12% with the whole number being 3,049. The narrow percussion blades (Navajas de percusion angostas) being the highest artifact in the core formation category at 5.01%, which makes the whole number 1,675, and macroblades (macro-navajas) being the second most at 2.41% with the whole number being 806. I would also like to add that Ken Hirth mentioned only one or two whole blades were found of the small final series at the site (Hirth, personal communication). With only a few whole blades found from the site this means that the obsidian blades were segmented. The weight for the obsidian artifacts is still being analyzed by Hirth and his students, so this measurement cannot be represented in this category (Carballo, personal communication).

Tlajinga 18:S3E1 (Figure 4.3) obsidian assemblage was a combination between Tlajinga 18:S3E1 and the Avenue of the dead, making it a total of 37,714 lithic material. Just as Tlajinga 17:S3E1 does not have the whole numbers, I will use the same method of conversion to get a rough estimation for this site. Tlajinga 18:S3E1's total lithic count is 26,585 with 26,569 (99.94%) being obsidian and the Avenue of the Dead total lithic count is 11,129 with 11,128 (99.99%) being obsidian. The pressure blade category was the highest category for both areas as it was the same for Tlajinga 17:S3E1. The most common obsidian artifact from both areas was prismatic blades (3rd serie: prismatica). The second most frequent category is the core formation category with Tlajinga 18:S3E1 having 7.81% (2,075) and the Avenue of the Dead with 15.67% (1,744). From the core formation, Tlajinga 18:S3E1 highest artifact was narrow percussion blades (Navajas: estrechos de percusion) at 5.17% (1,374) and the Avenue of the Dead. Where Tlajinga 17:S3E1 is situated could represent that is was a workshop for the domestic area (the

Tlajinga district) and for export to the smaller sites. This would make it easier to move material in and out of the city since it is next to the Avenue of the Dead.

Both Tlajinga 17:S3E1 and Tlajinga 18:S3E1 had close to 99% of the lithic remains being obsidian. With Tlajinga 17:S3E1 being an obsidian workshop that specialize with blade production it is no surprise that majority of the obsidian is from the Pachuca source since this is the preferred material to make blades. Tlajinga 17:S3E1 had a total of 95.19% (32,292) of the obsidian assemblage being Pachuca obsidian and 4.81% (1,632) belonging to the Otumba obsidian. Tlajinga 18:S3E1 had 99.94% of its lithic remains of obsidian and the Avenue of the Dead lithic remains 99.99% being obsidian with only one item being a single flint flake. This makes both areas favoring obsidian, primarily blades resulting in a high percentage of Pachuca obsidian. Both sites had segmented blades, but Tlajinga 18:S3E1 and the Avenue of the Dead have higher concentration. Obsidian blades were coming whole in Tlajinga 18:S3E1 and were intentionally being segmented into two or more pieces at a frequency of 7-8 times more than Tlajinga 17:S3E1. The segmented blades were from the first and second series and not the third series (Carballo and Hirth, 2014:142). This is a common practice for obsidian blades to be segmented because the consumer would get more blade edges instead of the typical two if the obsidian blade is whole.

In the urban sites, large number of obsidian artifacts were discovered and this is true with obsidian prismatic blades and obsidian cores. These obsidian artifacts were the highest representation of at the urban sites. Having a large amount of obsidian coming into these receiving site shows no short supplies of obsidian. It seems that these were readily available in both obsidian blades and prepared polyhedral core, even with the lower socioeconomic status compared to the center of Teotihuacan. As mentioned before with Tlajinga 18:S3E1 only having

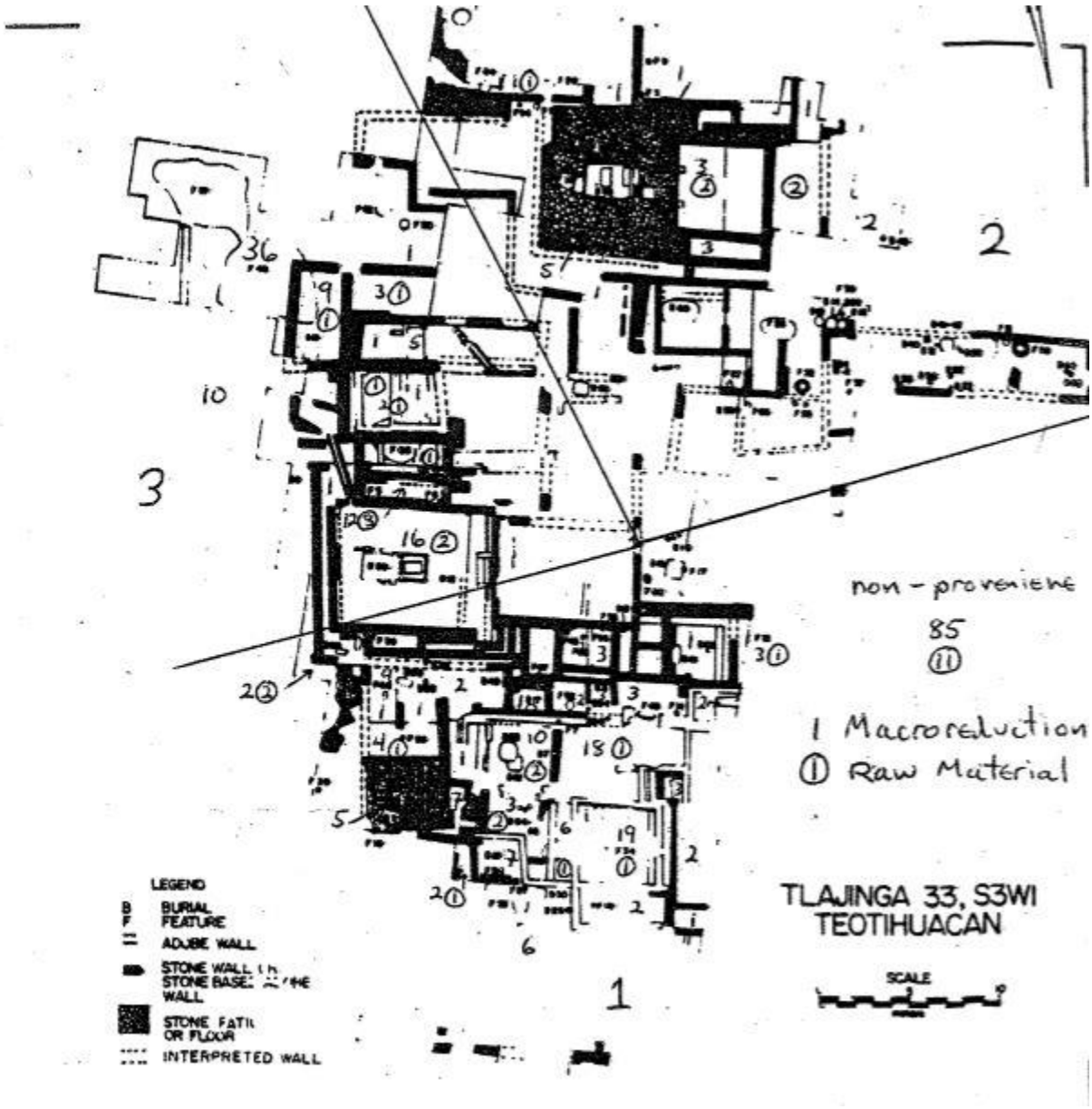

Figure 4.1 Tlajinga 33 Excavation Grid (Adapted from Sanders et al cited in Storey, 1985:75)

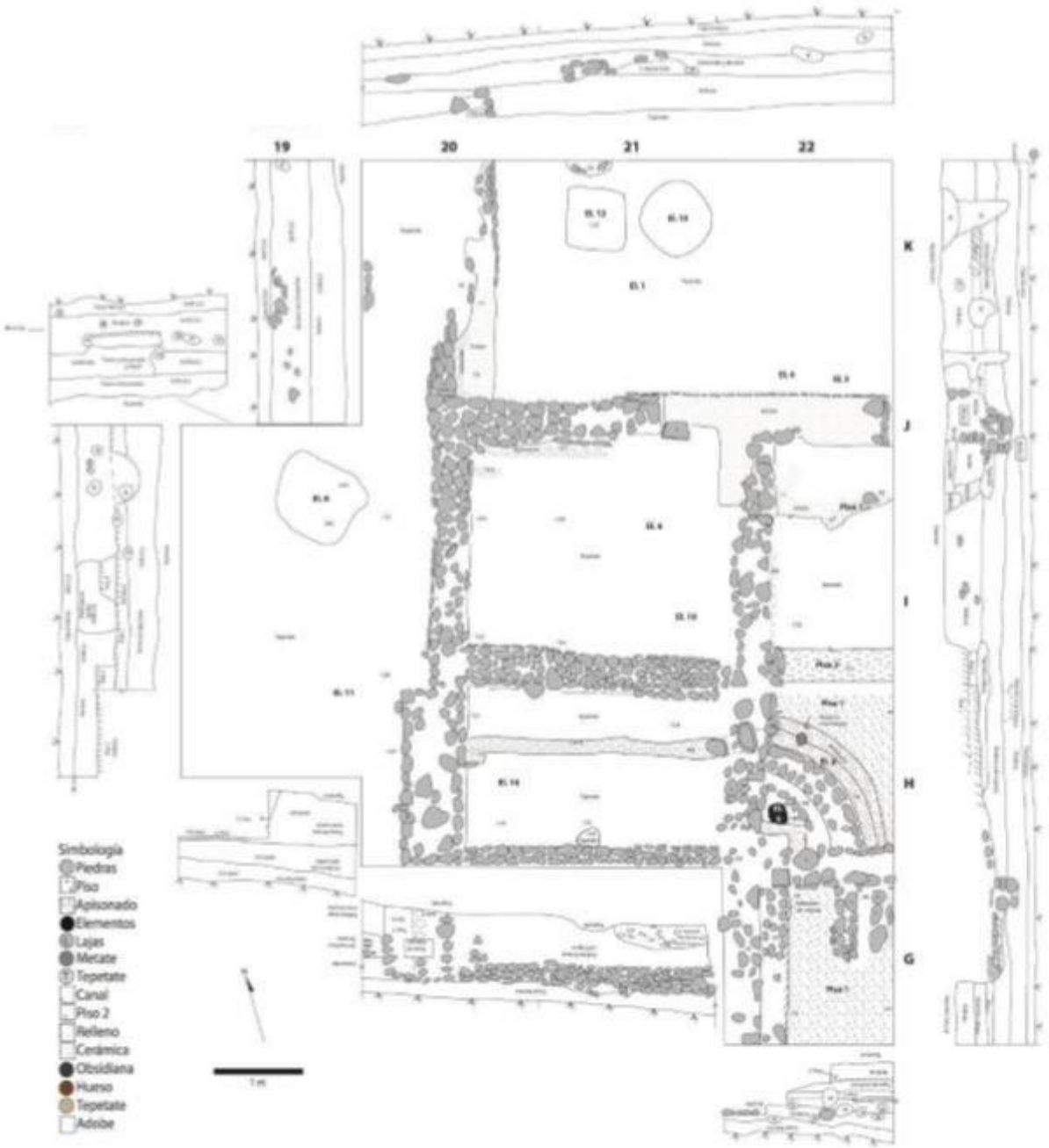

Figure 4.2 Tlajinga 17 Excavation Grid (Adapted from Carballo and Barba Pingarron, 2013:49)

Figure 4.3 Tlajinga 18 Excavation Grid (Adapted from Carballo and Barba Pinagarron, 2014:16)

a few whole blades found these blades would most likely been used as the autosacrifice since they are tended to be used for ritualistic context then domestic context. More details are needed to know the function of these whole blades.

Rural Data Set:

The rest of the obsidian data will be from the rural sites from the Teotihuacan Valley Final Report. I will mention the distance of each rural site from Teotihuacan since the distance would place pressure on the amount of obsidian arriving and the state the obsidian would be going into these sites. The distance to each rural site are estimates from using Google Earth and Google Maps by measuring each rural site from Teotihuacan from the descriptions of the site location in the Teotihuacan Valley Final report. The other factor I looked at is the architectural material used for the buildings of each site to see the socioeconomic statues of each site. This is also seen with the lack of structures from the less dense section of Teotihuacan, the "insubstantial structure". The insubstantial structure Robertson looked at in his 2006 project showed these structures to be in poor condition with minimal material used compared to the apartment compounds in Teotihuacan dense area (Robertson 2008). Many of the structures Robertson excavated shows the lower socioeconomic status within the city limit similarities the rural sites structures being on the lower spectrum except for Maquixco Bajo TC-8. Maquixco Bajo TC-8 is the only rural site that as similar architectural structure material and designs in the denser areas of Teotihuacan.

The first site will be Maquixco Bajo TC-8 (Figure 4.4), which was the largest of all the rural sites in the Teotihuacan Valley Final Report that was excavated and about 5 kilometers west of Teotihuacan. Mixcuyo TC-5 (Figure 4.5) is also in the same direction as Maquixco Bajo -TC-8, but it is a little further away from the city being 7-8 km. Both Tlaltenco TC-46 and

Tenango TC-49 are on the northern slope of Cerro Gordo. A mountain that stands north of the Pyramid of the Moon making the sites non-visible from the city. Both Tlaltenco TC-46 (Figure 4.6) and Tenango TC-49 (Figure 4.7 and 4.8) are roughly 15-17 km, which is going along the edge of the western side of the mountain. If trekking over the mountain it would be about 10 km, but considering the elevation, I would say it would be roughly 13-14 km. The last rural site is Xometla TC-21 (Figure 4.9) located in the modern village of Xometla and being 7 km southwest from Teotihuacan. From all the rural sites that are present, Tenango TC-49 and Tlaltenco TC-46 are the furthest away from Teotihuacan due to the fact Cerro Gordo which stands at 10,000 feet (this was taken in google map and looking at elevation maps to determine the size of the mountain). The rest of the rural sites have relatively same elevations.

As mention in the beginning of this chapter, Maquixco Bajo TC-8 architectural design and materials are similar to the ones found in Teotihuacan. This could show Maquixco Bajo TC-8 was imitating or was a part of Teotihuacan as a modern city with suburban areas that are connected. An argument about Maquixco Bajo TC-8 can be made that it is not part of the city like a suburban area due to the distance , this site shows similarities to the central area structures in Teotihuacan and influence the city had in the rural area (Widmer personal communication). Tlaltenco TC-46 material that was used for the two mounds that were excavated are cut and uncut basalt, tezontle stones, and tepetate (Sanders 1994:47). Stucco composed of tezontle gravel and clay was applied to the surfaces of wall and over a base of crushed tepetate to provide a floor surface. It seems that comparing to the Teotihuacan structure or Maquixco Bajo TC-8, this rural site was on the lower end of the socioeconomic level due to the material used. It seems the walls at Tlaltenco TC-46 were constructed from large irregular rocks and clay mortar. This site had large amount of the structure destroyed over the years,

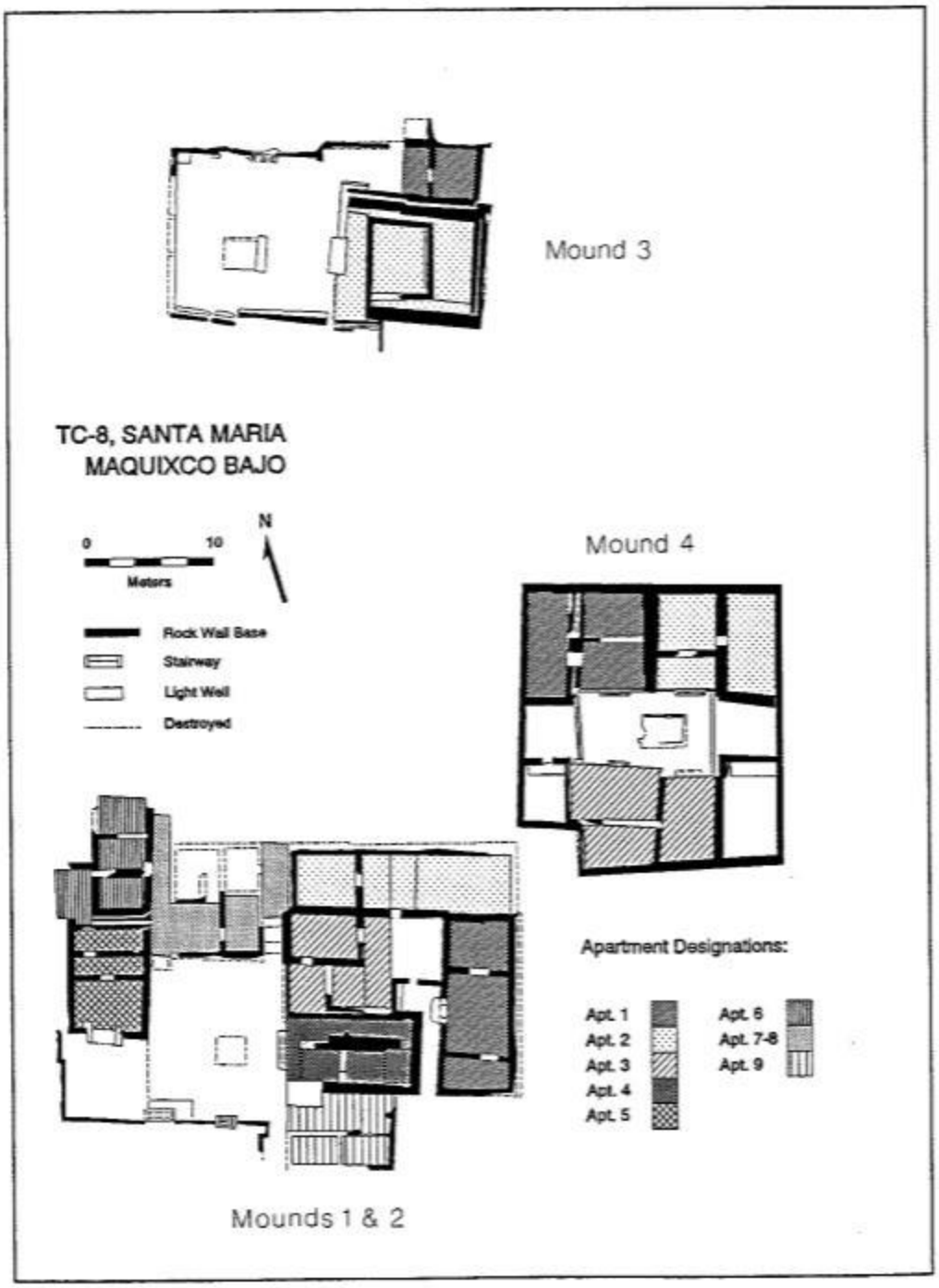

Figure 4.4 Maquixo Bajo Excavation Grid (Adapted from Sanders, 1994:45)

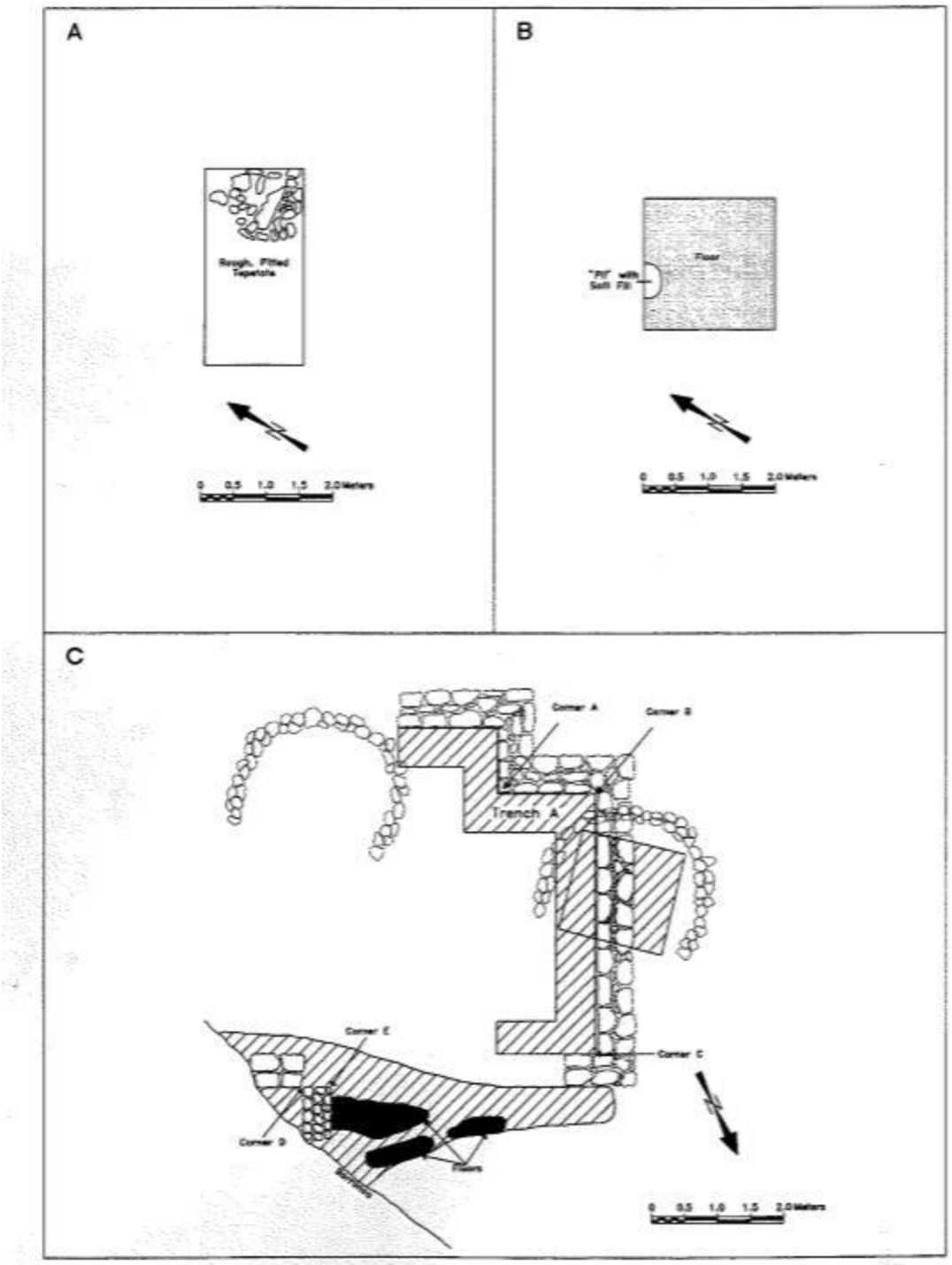

Figure 4.5 Mixcuyo Excavation Grid (Adapted from Sanders, 1994:87)

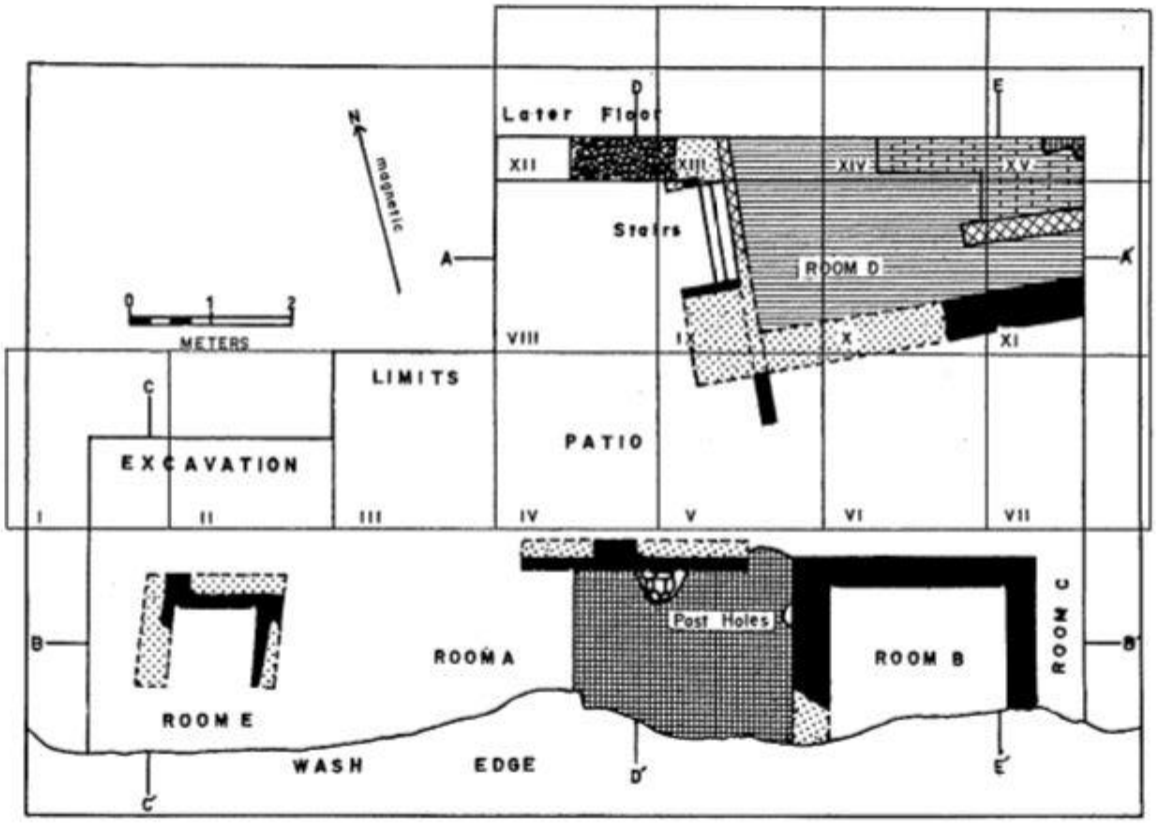

Figure 4.6 Tlaltenco Excavation Grid (Adapted from Sanders, 1994:53)

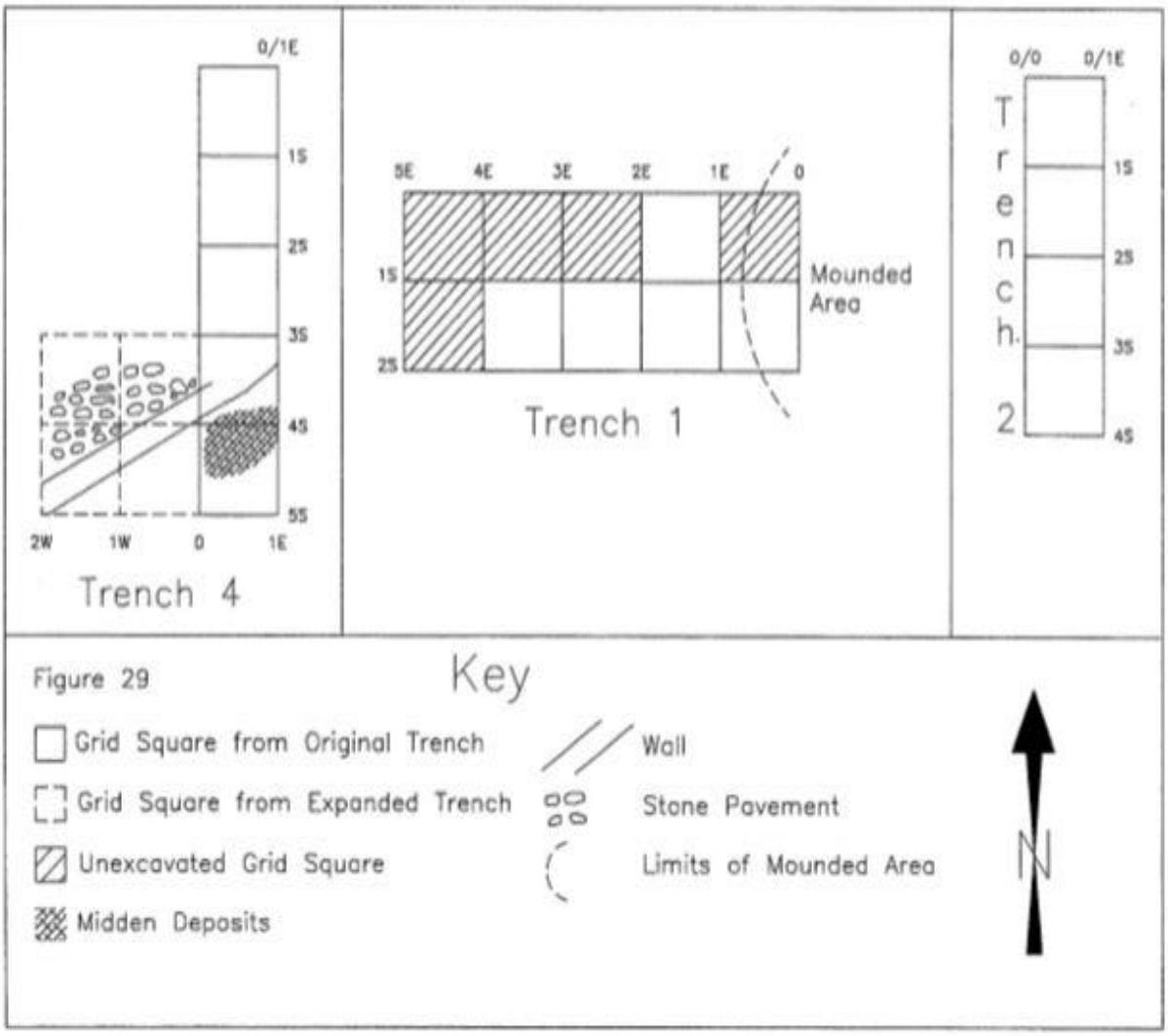

Figure 4.7 Tenango Excavation Grid (Adapted from Sanders, 1994:52)

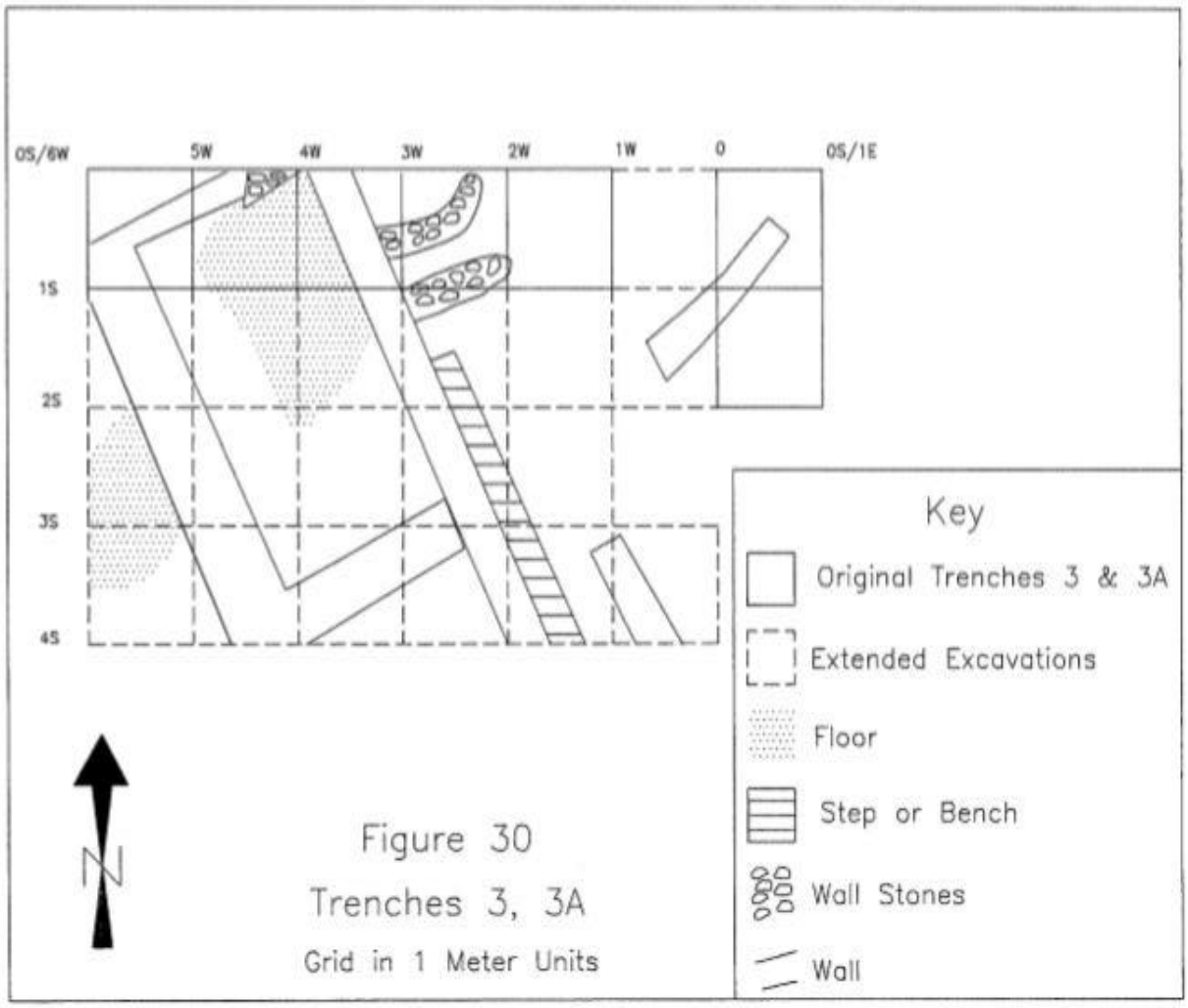

Figure 4.8 Tenango Second Excavation Grid (Adapted from Sanders, 1994:53)

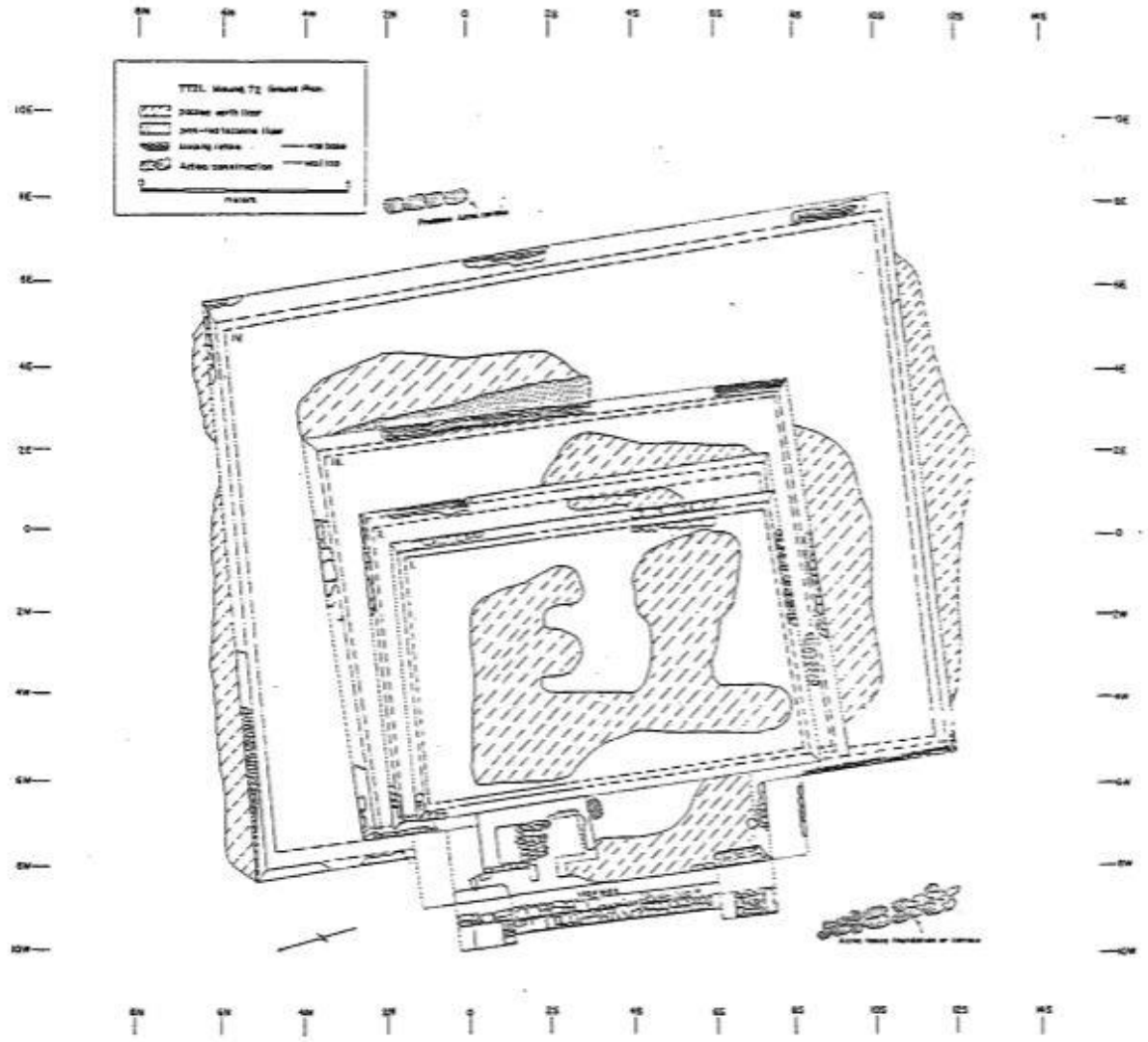

Figure 4.9 Xomelta Excavation Grid (Adapted from Sanders, 1986:128)

which is shown in the excavation of this site.

Sanders commented on both Tlaltenco TC-46 and Tenango TC-49 to be the similar in size of Maquixco Bajo TC-8, but excavation was limited and much of the structures were destroyed, and Sanders stated the excavation was too small to reveal any multi-room compound like in Maquixco Bajo TC-8 (Sanders, 1994). When Mixcuyo TC-5 was surveyed, the site had a different type of architectural design. It had u-shaped structure, linear terraces, and platform from the trench excavation. The site also revealed rock debris and large concentration of ceramics, it is unsure if these rock debris would be considered mounds, but most likely ruined structures due to natural and human factors. Sanders believed the u-shaped structures are too small to be residential family units, but suspected it to be garrison to house warriors. Other functions for the u-shaped were possibly used as platforms for a command function and possibly agricultural terraces to supply the warriors in the garrison. After the excavations, it turns out the hypothesis Sanders et al., had for Mixcuyo TC-5 were wrong. Mixcuyo was not a site being used as a garrison for housing warriors, but was a residential site from a probable village (Parsons and Sanders, 1996:883). The terraces and platforms that were mentioned were from the 19th and 20th century, when the area was being mined for stone. From the test pits excavation of Mixcuyo TC-5, rock rubble was used to form the base of the stone wall. Two possibilities happened at Mixcuyo TC-5: (1) the construction of the terraces and platforms by the Hacienda Cadena caused major destruction to the site and (2) the material that was used was adobe bricks and placed on very low stone wall base and many of floors had hard clay surfaces (Parsons and Sanders, 1996). Xometla TC-21 had one mound excavated that is believed to be a civic-ceremonial that had four construction phases. Much of the material that was used were from large cut and uncut rocks and river cobbles with mud mortar to hold the walls together for the platform.

Of all five rural sites, only four sites ranged between the Early and Middle Classic period during Teotihuacan reign. Xometla TC-21 (Late Classic or Early Toltec) was the only site when Teotihuacan was declining. Sanders et al., did not screen for small obsidian debitage, which plays a crucial part in determining the amount of obsidian artifacts that would be missed during excavation. Screening was done in the three urban sites of Teotihuacan.

In all five rural sites, the total sample size of lithic material is 3,173 artifacts that was recovered and analyzed in the Teotihuacan Valley Final Report. The lithic artifacts are categorized into: Blade Core and Core Tool Technology (Sanders 1995). The majority lithic artifacts are made up of obsidian (97.7%) for both industries with Pachuca obsidian being the majority at (61.8%), Otumba obsidian being the second (36%). Chert, was also recovered at the sites, a material also found in the Basin of Mexico, but was not heavily used and only appeared in 0 to 3.3% in the lithic assemblage with a total of 53. The focus of the lithic assemblage was the blade core technology category, which accounts for a total of 1,780 artifacts from the 3,173.

Three types of lithic raw were used in the blade core technology with Pachuca obsidian being the most (1,390), Otumba obsidian being the second most (384), and chert being a total of 6. The 6 chert blade artifacts are percussion blades, hinge recovery blades, and blade tools. No prismatic blades were made from chert. The chert that was found in the rural sites comes from an unknown source, but it is stated in the Teotihuacan Valley Final Report that the source probably came from the Tula area and the northwestern Basin of Mexico (Santley et al., 1995:472). The percentage of the blade core technology are Pachuca obsidian at 78.09%, Otumba obsidian at 21.57%, and chert being only .34%. The top three artifact types found at all rural sites: (1) prismatic blades (n=904), (2) irregular blades (n=360), and (3) percussion blades (n=181). Of the top three categorize, persuccion blades was the only lithic type to have chert

with a total of 3 from Tlaltenco TC-46. Adding these three types gives us a total of 1,445 blades (84.18%) from the total assemblage of 1,780 of the blade core technology. I should mention that the percussion blades did have three artifacts that were made from chert. The total percentage of obsidian is 99.79% (1,442) and chert being .21% (3). After looking at the total obsidian assemblage, I will discuss each of the rural sites individual.

Maquixco Bajo TC-8 was the site that had the most obsidian artifact, which is not surprising because of the full excavation at this site. A total of 633 (35.6%) lithic artifacts were recovered and used in the sample and from the total lithic artifact, Pachuca obsidian was the highest type of material found, second is from Otumba obsidian, and chert being the smallest amount found. Prismatic blades (n=304) was the most recovered artifact at this site, irregular blades (n=116), then percussion blades (n=8). Maquixco Bajo TC-8 does show large amount of obsidian due to the distance from Teotihuacan. The next site is only a few kilometers west of Maquixco Bajo TC-8.

Mixcuyo TC-5 had the least amount of lithic artifact recovered due to it only being a trench excavation and limited structures found. Much of the excavation was focused on uncovering the u-shaped building (see the functionality discussed above). It seems there was no household structure like in Maquixco Bajo TC-8, which would explain the small counts of obsidian. Prismatic blades were the most recovered artifacts at this site, following irregular blades, and finally percussion blades. Mixcuyo TC-5 also shows a strong favoring of Pachuca obsidian, with Otumba obsidian being the second most, and no chert was recovered. With a low amount of obsidian artifacts, it would seem production of blades was not a high priority and further details will be explained about this site.

Tenango TC-49 holds interesting results due to the type of excavation that was conducted. It was a trench excavation near Tlaltenco TC-46 that revealed a small village that has similarities with Maquixco Bajo TC-8. Even though it was a limited excavation, it resulted in a large amount of obsidian material with Pachuca obsidian being dominant. Tlaltenco TC-46, as mention with Tenango TC-49 in the northern slope of Cerro Gordo within walking distance but the furthest from Teotihuacan. Tlaltenco TC- 46, just like Maquixco Bajo TC-8, had full excavation on two mounds, Mound 1 and 2. It is believed that this site had multi-roomed house complexes with patio and raised platform (Sanders 1994:49). Even with a large excavation, it resulted being the fourth most lithic material recovered. Prismatic blades (n=53), irregular blades (n=39), and percussion blades (n=28), but in the percussion blades, 3 were made from chert. This is the most chert found in any rural site in the blade technology.

Xometla TC-21 is the final rural site with third most obsidian material with a total of 475 (26.7%). With being about the same distance as Mixcuyo TC-5 from Teotihuacan at a time when the city was declining. Xometla TC-21 is in the lower piedmont of the Teotihuacan Valley (Nichols and McCullough, 1986:63). From the total obsidian assemblage, both Pachuca obsidian and Otumba obsidian are almost distributed evenly. Prismatic blades were the most recovered artifacts at this site (n=235), following irregular blades (n=102), and finally percussion blades (n=60). Xometla TC-21 shows that the blade core technology was divided almost evenly of the two types of obsidian. A few reasons for this is Tula rising to power and limiting the flow of Pachuca of obsidian and Teotihuacan declining relying less on the Otumba obsidian.

In each of the five rural sites in the Teotihuacan Valley, blade cores were described as the discarded material after the process of prismatic blades removal (Sanders, 1995:475). These blade cores are exhausted obsidian cores, meaning after the removal of prismatic blades the

obsidian core cannot produce any more obsidian blades due to being small in diameter. There was a low amount of obsidian blade cores recovered from all site with a total of 64. From the of 64 total obsidian cores, 49 (76.56%) were made from Pachuca obsidian and 15 (23.44%) made from Otumba obsidian. Maquixco Bajo TC-8 had the most obsidian core being made from Pachuca obsidian and a small handful from Otumba obsidian. Xometla TC-21 had the second most obsidian core with Otumba obsidian being favored with 8 compared to only 5 made from Pachuca obsidian. Tenango TC-49 was the third most of blade cores with Pachuca obsidian being the highly favored and only 1 being made from Otumba obsidian. Tlaltenco TC-46 is fourth with blade cores numbers almost identical amount with Tenango TC-49. Mixcuyo TC-5 is in fifth and least amount of obsidian cores recovered with a total of 2 being made from Pachuca obsidian.

The weight that I will be using for the Teotihuacan Valley Final Project obsidian assemblages comes from Santley (1985) consumption rate of obsidian from Central Mexico (see Table 5.2). From looking at the cumulative weight in Santley (1985) article, I focused on the weights of prismatic blade and exhausted obsidian cores in all five rural sites. Weight is an important indicator because it can give the volume of the artifact (length, width, and thickness) and shows how much of the material the site utilized. To find the average weight for the two artifact types for each site, I am going to divide the cumulative weight with the number of the total count of the artifact. Each site average weight of prismatic blades and exhausted obsidian core can be seen in Table 5.2.

If I am going to use Maquixco Bajo TC-8 as a reference to how a rural site would interact, then I need to figure out what blades are going where and what they could be using them for. An issue I need to address with the comparisons is there is no blade category

breakdowns and are just grouped together as one. The only difference we get in blades, blade cores, and irregular core flakes, which are vague terms that cannot be easily identifiable from the data report. It is noted that obsidian blades were the choice when it comes to cutting instrument since it was majority of obsidian artifacts found at Maquixco Bajo TC-8. In the four mounds, it was commonly found in open area since this would be the location for people to produce blades and possibly other production. It seems that in mounds 1-2 and 4, obsidian blades are found in food preparation rooms, which shows the common function of this material. In mound 3 it is suggested from the high concentration of obsidian blades, it was used for special craft production since it was not found in food preparation rooms. The other material that is found in Maquixco Bajo TC-8 is gastropod shell and it seems that obsidian blades could have been used for various products. This would require use-wear analyze, but I have yet to see this in any of the rural sites.

Obsidian Symbolism:

The majority of the iconographies that will be used for the obsidian symbolism section of the thesis comes from Teotihuacan White Patio, Atetelco room. A great amount of my understanding of Teotihuacan imagery comes from Anna Headrick's (2007) book, *Teotihuacan Trinity: The Sociopolitical Structure of an Ancient Mesoamerica City.* These murals were chosen because they showed obsidian in a different context then what is typically found in iconography of obsidian atlatl dart points of warriors holding the atlatls. We see a mural (Figure 3.12) depiction of both atlatl dart points and obsidian blade in the same scene, but used differently from one another. The difference of between them is the atlatl was used as a weapon that the warrior is holding while the obsidian blade was used to cut the heart of the individual. One other thing that should be pointed out is atlatl dart points are always depicted being held by a warrior except in the case of the Storm God (Figure 3.16), who has the curved atlatl that was mentioned

at the end of chapter 3. The obsidian blades that will be explained later in this section showed use as both a tool and symbolic motif in the murals. Atetelco is also near much of the major structures of Teotihuacan.

Figure 3.12 mural is from the lower talud wall, Portico 3, White Patio, Atetelco, Teotihuacan and shows an individual in their traditional garment that is commonly associated with warriors from Teotihuacan. The garment consists of headdress decorated with feathers, the elaborate design of the outfit, and the depiction of large circular eyes that resembles goggle-like that usually have been associated with the Storm God, a god called Tlaloc by the later Aztecs. The warrior is holding atlatl spears, a common motif found in Teotihuacan, but instead of holding an atlatl thrower in the other hand, the warrior is holding a long-curved blade stabbing through a heart. The reason for this being a heart is due to the representation of droplets of liquid that are forming around the said heart meaning that this could be blood. Blood does play an important role in Mesoamerican cosmology since it was the life force for both people and deities. The blade could be made from obsidian because of the natural curve that happens when pressuring obsidian blades off obsidian cores. The curve is exaggerated greatly, since this type of blade is more likely to be curved in the distal end. It seems that obsidian blade is being held by a hilt with a long material that is hanging from the bottom in the warrior's hand. This mural shows both the obsidian blade as a tool and the symbolic purpose for the tool to be used in the sacrifice of a victim's heart (Headrick, 2007:79). An interesting note that Headrick makes in the same mural is the warrior headdress. Headrick said that above the rim of the headdress of the warrior has three obsidian knives. It is difficult to determine it to be obsidian since it does not show any curved edges, but it should be taken into speculation to further evaluate if that is true. I would also like to make note that the images on the edge shows rows of curved obsidian forming an

outline pattern. This item resembles the obsidian blade as the warrior in his hand and the other images that will be presented. This could be another way that obsidian was used in iconography as a pattern/design.

Figure 3.13 is from the lower wall of Portico 3 and it shows a canine sitting in a bowl or platform structure, but below the animal, there are three obsidian blades next to biznaga cactus. The biznaga cactus in the mural is depicted to be circular shape with spines coming from the edges. It is from the genus *Ferocactus*, a barrel-shaped cactus with large spines and small flowers. As before, the obsidian blades show curved ends just like in Figure 1.13. Why would a cactus be next to obsidian blades in the ground? It seems that the people of Teotihuacan knew that obsidian came from the ground, an obvious statement since the obsidian was a common material in the Basin of Mexico and knew of the mining process in the Pachuca source. The position of both the obsidian blades and biznaga cactus are shown coming from the earth, another sense of duality. Showing the essence of it being represented to an earthly feminine identity, as later represented in the Post-Classic. As mention in the Figure 3.12 with the obsidian blade functioning as a tool and ceremonial activity of heart impalement, the needles from the biznaga cactus could also be used for bloodletting that could probably be used for autosacrifice, just as obsidian could be too (Headrick, 2007:82). It also could be an offering to this canine that is sitting in a bowl since it seems the canine is projecting material from its month, as you can see a shell falling in that cloud like imagery.

Figure 3.14 shows a biznaga cactus with two obsidian blades coming from both sides, which is different from Figure 3.13 of the biznaga cactus and obsidian blade coming from the ground. What is different from Figure 3.13 is the obsidian blade's close association with the cactus and the ends of the blades having droplets that are like in Figure 3.12 obsidian blade

piercing the heart. The droplet imagery from the Figure 3.12 and 3.14 represent blood, and it seems that not only was obsidian blades used to draw blood, but the spines from the cactus could also be used for this method. Headrick states that this is blood, most likely belong to the user or victims' blood (Headrick, 2007:82). As the previous figure has shown where the cactus and obsidian stems from the ground, it shows that both have the same function.

The last iconography that I will be showing with obsidian blades is presented in Figure 3.15. The mural location is in Zone 2 of the Palace of Quetzalpapalotl in Teotihuacan. The mural is fragmented, but share the same obsidian coming from the ground with an animal sitting on a platform as seen in Figure 3.13. The animals are not canine, but feline, most likely a puma (Headrick, 2007: 82). It is the same as the other representation of obsidian blades with the blades being curved and on the ground. Being on the ground could signify where the blades could come from as stated earlier. It also could show the thought process of the realms that are shown about obsidian's involvement of the underworld. With the underworld being associated with earth, death, and other motifs. This makes obsidian being a common material to be associated with since there are realms having placement with obsidian as mentioned in Chapter 1. Another pattern is shown in all the figures I have presented and a common design is the curved end of the obsidian blades. What I can see this from is during the process of using pressure techniques on an obsidian core the blade to will take the curve shape. It is only shown on the outside edge of the curve and not on the inside. The reasoning behind this motif is something out of my knowledge as of right now.

The five images that have been presented with obsidian show the different ways the people of Teotihuacan saw obsidian. The first way is the usage as a tool, a tool for a simple function as shown with the warriors holding atlatl spear throwers with obsidian darts. As

mentioned in Chapter 1, during the Late Post Classic or Colonial period with indigenous people of Central Mexico cutting, shaving hair, and other simple functions. The other function is the symbolic aspect of obsidian as seen with a few of the gods and goddess that are shown in Late Post Classic and Colonial period. Their association with both the natural and supernatural world, which is shown in Teotihuacan with the Storm God holding a curved atlatl spear thrower. This is not the conventional function for an atlatl since it would be impossible to throw it accurately. It goes with the myth of how obsidian is made from the loud, powerful strike from lighting hitting the ground causing it to create the smooth glassy look and feel of obsidian. This duality aspect of obsidian as a tool function for daily life and ceremonial activities is what shows strongly in Teotihuacan, through its having a strong association with the militarism of the city and the way obsidian was seen through them and their deities.

The offerings excavated in Tlajinga 17:S3E1 had both Feature 1 and 5 being buried with obsidian cores. Feature 1 is 10 obsidian cores buried on top of human remains. This function is something I am unsure and would need further investigation to fully understand. Feature 5 is a cache offering of 18 obsidian cores and other artifacts covered by a metate. The cache offering in Feature 5 is located in Unit H22 Lots 98 and 170 in the southwest corner of the unit by a drainage channel (Carballo and Barba Pinagarron, 2013:55). Carballo associates the finding of the obsidian cores and other artifacts next to the drainage channel be related to water (Carballo and Barba Pinagarron 2013:55). An alternate explanation could involve an attempt to hide valuable resources from taxation to the city. The reason for being interpreted either way is the cosmology number of 18 and the cache's location next to water, which was the source of all life, and the amount that was buried with a metate being a placemat to hide the obsidian cores. Hiding resources to avoid taxation is not unheard of as seen with shells in Maquixco Bajo (Widmer,

personal communication). The majority of the obsidian cores are macrocores, which is being wasteful of the resources unless it is know that large amounts of Pachuca obsidian are coming into Teotihuacan. Further investigation is needed to evaluate if this was truly an offering or hiding the resources from authorities of the city since artifacts are still being analyze. Even though this may be the case, it still shows that there may be a symbolic purpose to obsidian besides the simple eccentric obsidian artifacts or utilitarian functions. The other idea this shows is the people of Tlajinga S3E1:17 buried large number of obsidian cores because it was one of the most common material the inhabitants had and shows the amount of obsidian that was coming into Teotihuacan.

The results of the obsidian assemblage of both urban and rural sites in the Teotihuacan Valley as shows Pachuca obsidian not being traded to the rural areas, but exchanging in a market system. With many of the rural sites being on a lower economic status, what could they possibly trade to acquired Pachuca obsidian? For Teotihuacan to economically sustain itself, it be best for the city to be a part of an independent market system with state supervision Even though trade and exchange was something found in Teotihuacan it was tended more for outside the region since they could send Pachuca obsidian as a commodity to build relationship with other city-state and their own elites to gain prestige or status with Pachuca obsidian. There was both an economic and symbolic value of Pachuca obsidian since the rural sites could acquire other lithic materials as seen with Otumba obsidian and chert, but preferred Pachuca obsidian. The details of the results will be further discussed in the next chapter.

Chapter 5: Results

Obsidian Data:

After looking at the obsidian data for the all sites in the Teotihuacan Valley, comparing both Widmer's and Healan's intraregional models for acquisition of Pachuca obsidian determine which model fits best for Teotihuacan's obsidian economy. Widmer's model follows 7 nodes with an eighth node being added, and each node following a specific location/function on foreign material coming into Teotihuacan. Healan models the obsidian workshops as part of an independent market system with state supervision on certain obsidian workshops for the city of Tula. When looking at the data and how it follows both intraregional model, Teotihuacan follows Healan's intraregional model of local obsidian consumption that is seen in Tula. Healan's intraregional model shows this with rural sites in the Teotihuacan Valley acquiring smaller obsidian cores compared to the larger obsidian cores in the urban sites. The urban sites had far greater amount of obsidian material then the rural sites (see Table 5.1), but the blade/core ratio shows that the urban sites were getting close to 80 blades per core, while the rural sites only produced less than 20 blades per core (see Table 5.1). Weights for the rural sites obsidian cores and prismatic blades was another important indicator for the rural sites getting smaller obsidian. In Table 5.2, the average mean weight of prismatic blade ranged from 1.95 g to 1 g and the obsidian cores ranged from 15 g to 3.3 g. There was no weight for the urban sites, but seeing the blade/core ratio, amount of obsidian blades and cores, and the average width for obsidian blades from Storey's thesis being 12 mm would show that they would be larger. The total amount of prismatic blades and obsidian cores is vastly different in both areas with the urban sites prismatic blades over 15,000 and obsidian cores close to 200, and the rural sites prismatic blades ranged from 22 to 276 and obsidian cores ranged 2 to 31 (see Table 5.1). The model shows the different

socioeconomic status between urban and rural sites as we see the total amount of obsidian material and blade/core ratio. The mixture of different stages of obsidian core (pressure, polyhedral, and exhausted), as well as obsidian blades found in the rural and urban sties shows the purchasing of obsidian cores from the market or obsidian workshops.

The obsidian that was being manufactured at Tlajinga 17:S3E1 was from macrocores that were reduced to pressure and polyhedral cores, then moved to the market or the inhabitants acquiring the obsidian from the obsidian workshops. This means that the obsidian being imported into the city were macrocores and not obsidian blocks or cobble. As Tlajinga 17:S3E1 being one of the obsidian workshops that supplied the Tlajinga District, the city market, and parts of the rural area. These cores will then be cycle in the market or sold by the workshops to receiving sites like Tlajinga 33:S3W1, who will make their own prismatic blades from large polyhedral obsidian cores. Prismatic blades were also being produce at the workshop and was following the same pattern as obsidian core, but it is seen that both Tlajinga 33:S3W1 and 18:S3E1 also produced their own blades from large polyhedral cores. Being a higher rank then the rural sites and closer access to the market or obsidian workshop, both Tlajinga sites can get the larger obsidian cores, as we see the large amount of obsidian from the total obsidian assemblage. Looking at the data set that was used from previous data, the sites had a large amount of percussion blades being produced, which is the type of blades associated from large obsidian pressure core until it is reduced into a polyhedral core to produced prismatic blades. With reference to Table 5.1, Tlajinga 33:S3W1 and 18:S3E1 had large numbers of prismatic blades made primarily from Pachuca obsidian (over 90%). Even though both sites are in the same district, Tlajinga 18:S3E1 had a much higher count of obsidian artifact and total lithic material. This could be the result of the site being next to the obsidian workshop making it easier

to access the material compared to Tlajinga 33:S3W1, which is just a few meters away (see Figure 3.2). The blade/core ratio for the urban site is ranged 74 to 96 blades per core. The urban sites are getting the larger obsidian core to produce the vast amount of obsidian blades. The high numbers from the urban sites shows that distance was not a factor for the people since they can easily obtain obsidian and would not need to travel far to the market or obsidian workshop. This is a different scenario with the rural sites, where the closet rural site is 5 kilometers from the city.

Where Tlajinga 17:S3E1 is situated could represent the obsidian workshop for the area (the Tlajinga district) and for selling obsidian cores to the market and exporting outside the city to the rural sites. This fits the type of obsidian workshops that Michael Spence originally gave as a regional workshop because Tlajinga 17:S3E1 obsidian workshop is specialized, near a large public structure or area, and situated on the south edge of Teotihuacan to create easy access in and out of the city and the rural sites in the Teotihuacan Valley like Maquixco Bajo TC-8, Mixcuyo TC-5, and Xometla TC-21. The other two sites, Tlatlenco TC-46 and Tenango TC-49 are in the opposite direction of this obsidian workshop and would need another workshop or market to acquire the obsidian material.

The main form of acquiring obsidian in the rural area is by going into the market of Teotihuacan or vendors and purchasing smaller obsidian polyhedral cores instead of larger obsidian cores that is seen in the urban sites. This is seen with the amount of debitage for obsidian core formation, the weight of the exhausted obsidian core, and the ratio of prismatic blades/exhausted obsidian cores (see Table 5.1 and 5.2). Distance is an important factor for the people of the rural area to travel to the city market because it is more economically efficient to get an obsidian core then just obsidian blades. Teotihuacan obsidian economy goes along Tula model of a market system with the interaction between people in its own city and the

surrounding area. As the Pachuca obsidian is moving further away from the city, the narrower and smaller the obsidian becomes. Evidence of a large-scale trade and exchange is minimal at best due to the Pachuca obsidian decreasing in quantity as the obsidian is moving outside Teotihuacan, but not being the focus of a trade and exchange between the rural and urban sites. With the rural sites being lower status, it would be better to used other material that is within the area for blades since there was some sites (Tlaltenco TC-46) that had blades from other lithic material. The lithic materials the people of the rural area could use due to their socioeconomic status would be chert. As seen with Tlaltenco TC-46 having chert (percussion blades) or the rural sites could have used Otumba obsidian far more frequently for blades since the source is much closer to Teotihuacan and the rural area. It seems that the demand of Pachuca obsidian for the rural sites is something they saw a symbolic value in it besides the tool function and not only in the rural area, but the Teotihuacan and different regions. The green-gold color of Pachuca obsidian is the first thing anyone would notice then the regular black or in case of the people of the Basin of Mexico, the grey color Otumba obsidian. The association that obsidian blades had in the Teotihuacan mural shows its connection with blood and the ground (see Figure 1.12-1.15). Bloodletting or autosacrifice ritual practice can easily be done by anyone since all it would take is an individual to make a small incision with an obsidian blade. This shows the duality of obsidian blades as a basic tool in a domestic context and a ritual context with the availability and the amount of Pachuca obsidian coming into Teotihuacan.

Both urban and rural sites had small errors in obsidian blade production from prepared cores. This indicates that people are directly buying obsidian cores from the market to produce blades and have the technical ability to do this. Therefore, the process of removing obsidian blades from a well-prepared obsidian core is very simple and would not take much effort.

Site Name[c]	Total Obsidian Assemblage	Pachuca %	Otumba %	Other lithic material	Total Obsidian Prismatic Blade	Prismatic Blades (Pachuca %)	Total Obsidian Core	Obsidian Core (Pachuca %)	Pachuca Blade/Core Ratio	Urban	Rural	Distance (km)[b]
Tlajinga 18:S3E1	37,697	33,927 (90%)[a]	3,770 (10%)	17	19,218	17,296 (90%)	315	234 (90%)	73.91:1	✓	×	0
Tlajinga 33:S3W1	24,375	20,529 (84.22%)	3,846 (15.78%)	0	18,009	16,692 (92.67%)	199	174 (87.44)	95.93:1	✓	×	0
Maquixco Bajo TC-8	1,173	861 (73.4%)	312 (26.6%)	44	304	276 (90.79%)	36	31 (86.11%)	8.9:1	×	✓	5
Mixcuyo TC-5	114	85 (74.56%)	29 (25.44%)	0	26	22 (84.62%)	2	2 (100%)	11:1	×	✓	8
Tlaltenco TC-46	239	182 (76.15%)	57 (23.85%)	7	53	44 (83.02%)	6	5 (83.33%)	8.8:1	×	✓	16
Tenango TC-49	661	530 (80.18%)	131 (19.82%)	15	286	259 (90.56%)	7	6 (85.71%)	43.16:1	×	✓	16
Xomelta TC-21	911	302 (33.15%)	609 (66.85%)	5	235	167 (71.06%)	13	5 (38.46%)	33.4:1	×	✓	7

Table 5.1 Obsidian Assemblage of urban and rural sites in the Teotihuacan Valley (Adapted from Sanders, 1994:483; Storey, 1985; Carballo and Hirth, 2014:145)

a. The Pachuca obsidian percentage of Tlajinga 18:S3E1 is an estimation since analysis are still be conducted at the time
b. The starting point in the distance is in the center of Teotihuacan
c. Tlajinga 17:S3W1 was not included in this table because its primary function was producing then consuming

Site Name	Number of Pachuca Prismatic Blades	Cumulative weight in grams of Prismatic Blades	Mean weight of prismatic blades in grams	Number of Exhausted Pachuca Obsidian Cores	Cumulative weight in grams of Exhausted Obsidian Cores	Average mean number of Exhausted Obsidian Cores
Maquixco Bajo TC-8	278	542.0	1.95	29	434.0	15
Mixcuyo TC-5	22	27.0	1.23	2	17.4	8.7
Tlaltenco TC-46	44	67.7	1.54	1	3.3	3.3
Tenango TC-49	259	258.5	1	5	21.9	4.38
Xometla TC-21	167	209.8	1.26	3	33.6	11.2

Table 5.2 Teotihuacan Valley Pachuca Obsidian Weights (Adapted from Santley et al., 1985:110)

While the urban sites could purchase obsidian blades directly from workshops; the rural sites do not have that option. In the Teotihuacan Valley Final Report, Sanders does state that rural sites are getting obsidian cores to make their own blades, as well as acquiring blades at the market, or a mixture of both like in Tlajinga district (Sanders, 1994).. This is reflected in the ratio of obsidian blades to cores, and the average weight of prismatic blades and exhausted obsidian core

diminishing as a function of distance to Teotihuacan (See Table 5.2 and Figure 3.1). The ratio difference between urban and rural sites is vastly different as urban sites had more than 70 blades per core while the rural site is less than 15 blades per core except for Tenango TC-49 (43.16:1) and Xometla TC-21 (33.4:1). This indicates that urban sites are starting with large blade cores and therefore producing more blades. The only rural site that has the large number of obsidian cores is Maquixco Bajo TC-8 with a total 31 Pachuca obsidian cores but only 29 were used for the weights measurement from Santley's (1984) article. Besides that, this was the most excavated rural site compared to the others, and it seems that this site was higher in the socioeconomic ranking. The average mean weight of prismatic blades for each rural site: Maquixco Bajo TC-8 (1.95), Mixcuyo TC-5 (1.23), Tlaltenco TC-46 (1.54), Tenango (1) and Xometla (1.26). The average mean weight of exhausted obsidian cores for each rural site: Maquixco Bajo TC-8 (15), Mixcuyo TC-5 (8.7), Tlaltenco TC-46 (3.3), Tenango (4.38), and Xometla TC-21 (11.2). This shows that the site that produced the largest number of prismatic blades and exhausted obsidian is Maquixco Bajo TC-8. The ratio and weights of obsidian blades and cores shows that people in rural sites are getting obsidian cores instead of obsidian blades thereby maximizing the number of blade sections that can be made into tools from whole blades. This is a better economic practice then just getting obsidian blades since you get more tools from the core itself then purchasing blades alone.

One hypothesis I was not able to fully answer for Tlajinga 17:S3E1, Tlajinga 18:S3E1, and the rural sites was the medial section being the most desirable section of obsidian blades and was therefore kept in the city. The distal, proximal, and medial blade section data were not available from the rural sites and Tlajinga 17:S3E1 and Tlajinga 18:S3E1 are still being analyzed. It should be noted that each urban site besides Tlajinga 17:S3E1, which did it less

frequently, were intentionally breaking the blade into segments (Storey, 1985; Carballo and Hirth, 2014). The reason for intentionally breaking a whole prismatic blades is obtaining more than one tool per blade. Even though obsidian is the sharpest material in the world, it is a brittle material that can break with little force (depending on the surface it comes in contact or how much force is being used). With the blade being segmented, you get four cutting corners from the segmented medial blade section. With the medial section of the blade providing four corners for cutting instead of the typical two. Even though I was not able to fully answer this hypothesis because the rural sites did not show a category of segmented blades it does not mean that blades were not being segmented. The rural sites were making their own obsidian blades, but much narrower compared to the urban sites since they had less socioeconomic status to obtain larger obsidian cores. It was more economically efficient to obtain obsidian cores to produce their own blades to break to have more tools.

As we move further away from the city, the weight of prismatic blades and obsidian cores becomes smaller. This means distance was a large factor in traveling to the city to purchases obsidian cores to produce blades. Even though it is better to purchases an obsidian core, the obsidian cores the rural sites were getting were far smaller compared to the urban sites. As stated before the difference in core to blade ratios between rural and urban sites shows the socioeconomic status difference between the urban sites living in the city while the rural sites had to walk a good amount every time they needed obsidian. We see this with the site Tlaltenco TC-46 and Tenango TC-49, the furthest rural sites from Teotihuacan. It shows the size of prismatic blades and obsidian cores being the smallest in the rural sites data (see Table 5.2). Even though Tenango TC-49 had similar numbers to Maquixco Bajo TC-8, the size difference of prismatic blades between these sites is one gram with Maquixco Bajo TC-8 having an average

prismatic blade weight of 1.95 g and Tenango TC-49 having an average prismatic blade weight of 1.0 g indicating that Tenango has much smaller blades.

This also reflects status and wealth of the sites. Both Tlaltenco TC- 46 and Tenango TC-49 have residential and temple architecture using the less quality material compared to the urban sites and Maquixco Bajo TC-8. The other factor is human interaction and natural occurrences like erosion. This is evident with the amount of obsidian material found at the rural sites. Each of the site inhabitants would be at a greater risk if going to the Pachuca source since that is close 50km distance of walking from the Teotihuacan Valley. Just walking from Teotihuacan to the Pachuca source would take between 13 to 18 hours and this is further increased with the rural sites. The risk is less when traveling to the marketplace of Teotihuacan to get the necessary obsidian materials. It also reflects the amount of obsidian each of the rural sites could get as we see that Maquixco Bajo TC-8 has the highest in prestige.

Adding Xometla TC-21 to the data, the site shows that both Pachuca and Otumba obsidian was being used at the same rate for prismatic blades, implying that the influence of Teotihuacan has started to go down in the Late Classic period. During the occupation of Xometla TC-21, the amount of Pachuca obsidian has declined and Xometla TC-21 was acquiring more Otumba obsidian. However, even though Otumba obsidian prismatic blade use was increasing Pachuca obsidian was still the preference for prismatic blades, but the numbers are small compared to the other rural sites in earlier periods. This could indicate that Teotihuacan was losing control or influence over Pachuca obsidian coming into the Teotihuacan Valley. During the occupation of Xometla TC-21, Tula began its ascent into a powerful urban center that had a strong interest in Pachuca obsidian. Tula is much closer to the Pachuca obsidian source and probably did not want to distribute as much of the obsidian. This is just speculation, but with the

increased number of grey obsidian artifacts in Xometla TC-21, it could reflect the declining militaristic presence of Teotihuacan because of the high number of biface and uniface for Otumba obsidian and even distribution between the two types of obsidian.

Healan's model also does not need to follow a linear distance blade frequency model because the obsidian workshop of Tlajinga 17:S3E1 was a short walking distance from Tlajinga 33:S3W1 and 18:S3E1. It is highly plausible that the workshop could act independently from the market system and be directly exchanging the obsidian material with residential compounds within the Tlajinga barrio. Spence's (1981) article shows that different types of obsidian workshop being placed near different spaces in the city with different purposes fits well with the independent approach with state supervision from Healan's model. Spence stated that the only type of obsidian workshop that would be under state supervision is a precinct obsidian workshop (Spence, 1981, 1987). Obsidian production from regional obsidian workshops could go in either direction, which is one of the cases that Healan made for the local obsidian model for Tula, as Tula had a mixture of obsidian workshops both under state supervision and acting independently (Healan, 1993). The state supervision of the obsidian workshops is one aspect that tells us how the city is interacting with the obsidian workshop. The cache "offerings" of polyhedral blade cores that were found Tlajinga 17:S3E1 might be an example of a response to this state supervision.

In Tlajinga 17:S3E1 Feature 1 and 5 having a cache offering of obsidian cores and other buried materials. There is still much debate on the reason for the cores to be buried in a cache site. Carballo believes this to be an offering to water or association with water, while Widmer suggests the cache was used to hide the obsidian cores from taxation as Maquixco Bajo TC-8 did with marine shells (Carballo personal communication; Widmer personal communication).

Further investigation of the cache offering in Tlajinga 17:S3E1 are still needed to fully understand the cache offering of large amount and quantities of obsidian cores.

Obsidian Symbolic Meanings:

In each of the murals the key function of duality between certain items played a key role in Teotihuacan mythos, with the Storm God, predecessor of Tlaloc being one of the main deities present in Teotihuacan. The Storm God was associated with rain and lighting, and being represented with a lighting atlatl (See Figure 3.3). Many of the murals in Teotihuacan shows this type of duality of sacrificing to higher beings and earthly essence, such as with the Teotihuacan warrior using a curved obsidian blade with a heart through it or the curved obsidian blades next to the biznaga cactus. The presence of duality showed how the people of Mesoamerica preserved and understood the world. You see this view of duality in how the gods and goddess are shown, like Tezcatlipoca being able to become a jaguar or the mirror as a foot to show the underworld. The curved motif seems to be one of the best way to identify obsidian blades in the iconography because it never lost that curve. Even in the drawings that are shown in the Codex, the curved end of the obsidian blade is still shown. The incorporation of iconography symbolism on obsidian does give small details on Teotihuacan perspective with the use of obsidian blades. One issue that does come from this is whether the obsidian blade is from the Pachuca source or from another obsidian source.

The data that has been presented for this thesis on the trade and exchange of obsidian, has shown that the focus on trade and exchange of Pachuca obsidian was not largely present. Especially with the addition of the two new sites (Tlajinga 17:S3E1 and 18:S3E!) that have been excavated, the data shows Pachuca obsidian in a market system like Tula. This comes from the Healan's intraregional model of local obsidian consumption in Tula. The model also shows the

socioeconomic difference between living in Teotihuacan and the rural area. It shows the model being applicable with other sites which makes a stronger understanding of Teotihuacan and other Mesoamerica sites in the economy of obsidian. The symbolism of obsidian in Teotihuacan was but a small scale compared to the many visual references to militaristic and animalistic imagery. Obsidian is shown in the murals that were presented in the thesis, but was just a small part of the whole murals. The exception is with the biznaga cactus and the obsidian blades with blood. The people of Teotihuacan understood the sharpness of obsidian and could easily see how it can easily cut through any type of material. Much of the imagery of obsidian was shown in basic utilitarian form, as the dart points on the atlatl and curved blades. There were a few murals that had it as a design pattern as seen in Figure 1.12 of the edges were surrounded by obsidian blades. I do not know how common this motif is, but it could be something that be further considered given this significance of it being associated with obsidian blades.

Chapter 6: Conclusion

During the Classic Period, Teotihuacan was the largest site that was occupied in the Basin of Mexico. The thought of Teotihuacan trading and exchanging with other regions in Mesoamerica, interregional exchange, has been a topic of interest because of large size city-state interacting with another large city-state. After the results of the data that were presented in the previous chapter it shows Pachuca obsidian being more in line with Tula model of local consumption of obsidian focusing more on obtaining obsidian from within its own region rather than from outside the region (Healan 1983). No trading of obsidian was present between Teotihuacan and the rural area. Instead members of rural sites traveled directly to Teotihuacan to obtain obsidian from either the market or workshops. They sought out already prepared and partially reduced Pachuca obsidian cores from which to produce obsidian blades. This is seen in the size of the blades from rural sites and the very small ratio of blades to cores in the rural sites. The recent excavations of Tlajinga 17:S3E1 and 18:S3E1 together with previous excavation and obsidian analysis for 33:S3W1 show a better understanding of the economic role obsidian played within a single barrio within Teotihuacan itself. It appears that two sites, 33:S3W1 and 18:S3E1, within the Tlajinga Barrio were directly obtaining obsidian blade and cores from a workshop, 17:S3E1, within the barrio. The Teotihuacan city fits along the same model Dan Healan presented for Tula in which there is a mixture of acquiring obsidian cores and blades from vendors (obsidian workshop) and market areas.

From the obsidian assemblage of the Teotihuacan Valley, urban and rural sites show the difference in market exchange and acquisition in Teotihuacan with urban sites acquiring large obsidian cores (pressure or polyhedral core) while rural sites only acquired small obsidian cores

(reduce polyhedral cores) (see figure 6.1). This shows the difference in the socioeconomic statuses between both areas and advantages in living in a large city. The urban sites were close to the market and obsidian workshops and getting larger and better quality Pachuca obsidian cores to produce their own blades. People from the rural sites, depending on the location, had to walk a small distance to the market or obsidian workshop. The short distance that is needed to travel to the city does not take more than a day, but one should consider what can be carried back and what can be afforded by the rural area people. The distance also shows that size of obsidian cores and prismatic blades tended to become smaller (weight and number of artifact) the further away from Teotihuacan.

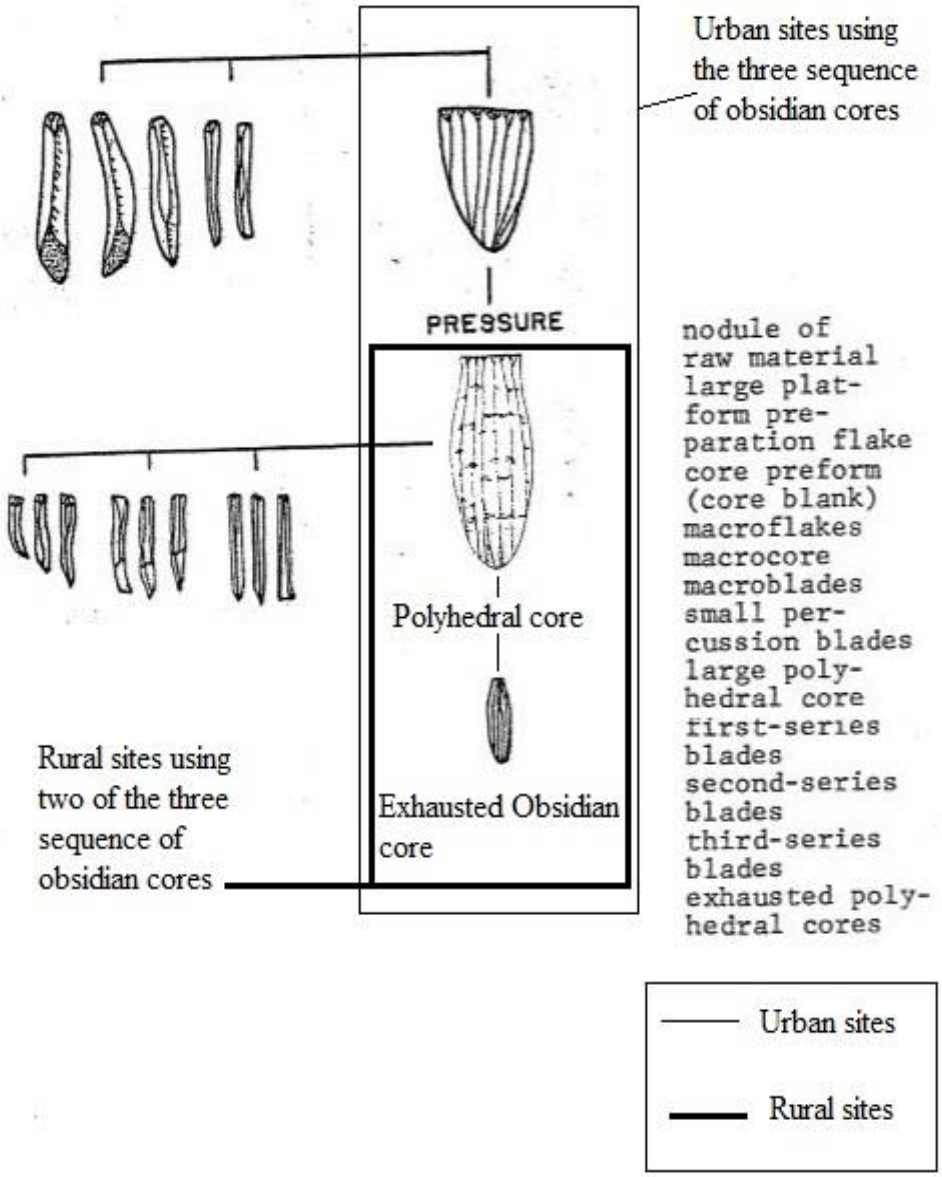

Figure 6.1 State of obsidian cores each area was acquiring (Adapted from Clark 1983 Figure 7 cited in Storey, 1985)

The size and sequence of an obsidian core reduction is different between urban and rural sites because the rural sites were not able to afford the larger better quality of obsidian cores. Therefore, we see a small amount of obsidian artifacts and size difference between the two areas (see Table 5.1 and 5.2). The urban sites easily recycle the obsidian core back to the market since obtaining obsidian blades is easier in the urban area than rural area. With an already reduced core at the market, the rural area would be afforded the smaller core and still get a decent amount of obsidian blades from the reduced core. The rural sites were on a lower socioeconomic status than the urban area, then why not used another type of lithic material? In Chapter 4, some of the rural sites did have chert, another type of lithic material that was used as a tool, and is sturdier when compared to Pachuca obsidian.

The desirability of Pachuca obsidian for the rural sites reflects on why the rural people wanted this type of lithic material and not another lithic material (chert) that would be less costly. With green coloration being an important symbolic view in many Mesoamerican culture and knowing that Pachuca obsidian was a green-gold color. People would want to emulate a higher status like elites and their association with gods and goddess. This is seen also with a higher preference of Pachuca obsidian over Otumba obsidian, even with the Otumba source being much closer to the city than the Pachuca source. Otumba obsidian was also being used for obsidian blades, but were straighter compared to Pachuca obsidian blades that were slightly curved. The symbolic value Pachuca obsidian had in Teotihuacan is another reason the rural sites would desire to get this type of obsidian. In the murals that were presented in this thesis, many murals have shown curved obsidian blades being used in a symbolic sacrifice and its association with the earth and blood. People would want to give return to the gods that give them life, as seen with blood being the component the gods and goddess gave life to the people. The people

saw a way to repay the deities with autosacrifice by bloodletting using obsidian blades, since it is easier and anyone can do this. As mention before other materials could have been used, but Pachuca obsidian was the choice as seen with the large number of obsidian materials. This shows the two different sides of Pachuca obsidian in Central Mexico, as Pachuca obsidian was viewed as having both economic and symbolic value. It was used both as a utilitarian domestic tool and as a tool with symbolic functions in a ritual context. The representation of Pachuca obsidian green-gold color gives both values due to green being a symbolic color and the economic value that anyone can acquire Pachuca obsidian as seen with both urban and rural obsidian assemblages.

It is necessary to advance research beyond the methods and techniques that have previously been utilized. In the past, the data had limitations of site excavation and definitions of obsidian typology, which prevented a clearer understanding of the Teotihuacan obsidian production and use and its role in the economy. Santley weighed the obsidian but did not take measurements of the blades while at Tlajinga 33:S3W1 measurements were taken but weights of obsidian blades and cores were not taken. While Tlajinga 17:S3E1 and 18:S3E1 are still being analyzed, both sites (from my knowledge) have done the necessary and important measurements (length, width, thickness, and weight) on obsidian artifacts material. The studies of lithic material and obsidian in the Teotihuacan area and Mesoamerica have improved greatly from the beginning. The future of these areas and field of study can reveal a better understanding the importance of not just economic reasons, but symbolic value of obsidian in various forms. It seems that the next step for understanding Teotihuacan obsidian industry is to follow the survey and excavation of a local obsidian workshop area to compare all three types of obsidian workshops in Teotihuacan. If a local obsidian workshop that Spence mentioned in his article

(1981) is excavated, one can start to see the complex economic standing obsidian had since it was not saw as just an economic item, but also a symbolic item.

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