THINKING AND DRINKING CHOCOLATE:
THE ORIGINS, DISTRIBUTION, AND SIGNIFICANCE OF CACAO IN MESOAMERICA

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I. Introduction

“In a Yucatan jungle clearing, knife-wielding Indian priest prepares to sacrifice a small brown dog with the misfortune to bear markings resembling a cocoa bean. A small boy peers at the scene while pensively munching a Twirl chocolate bar. His family call to him, their voices raised against the thunderclaps echoing through the forest fronds, and he skips across to see Hernan Cortes entering the court of Moctezuma” –Newspaper excerpt on “Cadbury World”

Even before chocolate became a major product manufactured by multinational companies such as Cadbury and Hershey’s which we buy in our everyday lives due to our love and fascination for it, chocolate acquired important social and ritual significance in Mesoamerica dating back to 1900BC in the archaeological record. With the discovery and introduction of the process used to make cacao seeds into a comestible substance which could then be prepared into a drink, “kaw-kaw” or chocolate came into existence. There is much more to chocolate than our usual association to it as a scrumptious sweet or foamy drink, since chocolate’s history is vast and still maintains association with its origins in the Americas (specifically Southern Mesoamerica) in the Pre-Columbian era, in some way reflected in the daily Cadbury tourist attractions at “Cadbury World” (Coe and Coe 2007:255).

Chocolate comes from the cacao tree (*Theobroma cacao* L.), a tree native to South America, but which, millennia ago, was spread by humans into Southern Mexico, Central America and in some Caribbean islands such as Trinidad y Tobago (Coe and Coe 2007; McNeil 2006). After the Spanish Conquest it was also transplanted to parts of Africa and in Hawaii. The study of *T. cacao*’s history has been a difficult and controversial mission due to its extensive geographical distribution, anthropogenic involvement, and interbreeding between the two taxonomic subspecies before the Colonial period (Ogata et al. 2006). As a result, this paper aims to explore the Pre-Columbian origins, distribution, and importance of *Theobroma cacao* and its possible ancestors in Latin America (and especially in Mesoamerica) based on published
I will first introduce cacao’s physical and chemical composition and its ecology, mapping the origins and distribution of three subspecies cacao. Later (Section II) I will examine its growing-zones and habitat in Mesoamerica. In Section III I will provide a brief overview of the pre-Conquest cultural history of cacao. Section IV presents a short explanation of the process required to turn cacao beans into a chocolate drink. I will then discuss the recent archaeological research by archaeologists who have found cacao residues in ancient pottery thereby contributing new perspectives on cacao’s history. I will map the sites in which cacao has been encountered and propose future directions for this type of research at more archaeological sites in Central and South America, regions for which currently lack any kind of cacao’s historical origins and uses (Section V).

In Section VI, I discuss the multiple distribution hypotheses previously proposed by some scholars and will present a new distribution proposal based on the GIS mapping of detailed topographic elevation maps of South and Central America. By focusing on the potential paths which cacao could have been transported and grown (at elevations ranging from sea-level to 1000m) it is possible to eliminate many previously proposed routes, and pinpoint the most likely locations for the cacao tree’s earliest and subsequent dispersals.

I will also discuss the ritual and cultural significance of cacao in Mesoamerica mainly based on the work done by specialists on the analysis of hieroglyphs and Mesoamerican iconography as well as ethnohistorical, ethnographic, and other historical accounts (Section VII). The last three sections specifically indicate that there is a commonality between the use of cacao in the archaeological and ethnohistorical record and in the iconographic analyses of vessels, temple
wall murals, and other artifacts found throughout Mesoamerica. All of these lines of evidence point to the use of cacao for ritual and social purposes and its significance in religious and mythological symbolism (Section VII and VIII).

II. Cacao’s Composition and Ecology

“The botanical name of the chocolate plant is Theobroma cacao, which means ‘Food of the Gods’”

There are two genera of trees to which cacao belongs: Theobroma and Herrania (Bletter and Daly 2006). Since these genera are in close relationship with each other, there are some subtle distinctions taxonomists consider in order to distinguish them. Herrania is differentiated from Theobroma by its compound leaves, petals and fruits. Herrania has compound leaves whereas Theobroma’s are simple in structure. Herrania’s calyx\(^1\) is regularly three-lobed versus Theobroma’s are five-lobed calyx, and its attachment in Herrania near the end of the petals is usually longer than the basal part and twirled versus the attachment in Theobroma two or three times in Theobroma which is instead flexed or erect (Bletter and Daly 2006:32). In addition, the fruits of Herrania are more inclined to be noticeably uneven with a drier husk. Currently, there are seventeen identified species in Herrania and twenty species in Theobroma (one of which has three varieties or subspecies).

Another important relative of cacao is the Theobroma bicolor Bonpl., which even though initially recognized as part of a third genus Tribroma due to the differences with Theobroma cacao L. (T. cacao) on structure, flower morphology, fruit husk, among some, has now been assigned to Theobroma (Bletter and Daly 2006:32). For the purpose of this study I will consider T. cacao since this is the species found in the archaeological and ethnobotanical record, as the species used for the preparation of chocolate since the Pre-Columbian era.

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\(^1\) The sepals of a flower, forming a protective layer around a flower in bud.
Some researchers such as Cuatrecasas, Figueira, Levy, Goldsborough, Van Hall, and Cheesman (see Ogata et al. 2006) have described three different species, three different “groups”, two subspecies, and a wide variety of cultivars in regards to cacao. Cuatrecasas, for instance, separated *T. cacao* into two different subspecies: *sphaerocarpum* (trees with smooth round fruits distributed from South America to Panama considered *forastero* cultivars), and *cacao* (trees with pointed, furrowed, warty pods distributed from South America to southern Mexico known as *criollo* cultivars) (Ogata et al. 2006:71). These researchers have distinguished these subspecies through the range of variation of the tree based on the structure of the fruit (i.e. trees with smooth round fruits or with pointed, furrowed, warty pods) (Ogata et al. 2006:71). Color of cotyledons\(^2\) is also an important characteristic to distinguish between *criollo* (white) and *forastero* (purple) cultivars, but is harder since color can be very variable and there is no correspondence between fruit shape and cotyledon color (Ogata et al. 2006:71). The variation between the two subspecies is known as the *trinitario* cultivars (found in the Trinidad y Tobago).

However, recent genetic research performed by Motamayor et al. (2002) using RFLP and microsatellite analyses on ancient *criollo* and *forastero* cultivars’ samples, suggests that due to the genetic results from both analyses there is not much genetic evidence for these as subspecies as first hypothesized by Cuatrecasas. Rather, *criollo* and *forastero* are just varieties of the same closely related domesticated species *T. cacao* (I will consider this new proposal when looking at the cacao distribution hypotheses in Section VI). Thus, Figure 1 presents the possible origin of the three cultivars (criollo, foretsero, and trinitario) based on Motamayor et al.’s (2002) results in which cacao originated in South America and was distributed later by humans into Central America and Southern Mesoamerica, as well as the cacao-growing regions in Mesoamerica based on the map by McNeil (2006:2).

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\(^2\) A significant part of the embryo within the seed of a plant.
T. cacao (Figure 2) is a difficult tree to grow since it only bears fruit within 20 degrees north and 20 degrees south of the Equator (neotropics) with temperatures ranging from 15-16°C in the coldest months, commonly within 22 to 32°C throughout, and up to 38-40°C as the hottest limit, in year-round humidity (especially in the Pacific Coastal plains of Chiapas and Guatemala) (Coe and Coe 2007; Ogata et al. 2006). This has to do with the cacao trees’ pollinators which are female ceratopogonid (midges) and cecidomyiid flies, and bees which need humid environmental conditions with water-holding-plants for larval development, along with shade and a varied canopy (Bletter and Daly 2006:35). In addition, in large-scale plantations midges do not thrive in large enough populations, and even when a vast number of flowers are generated by one cacao tree, only 1 to 3 percent annually bears fruit (Coe and Coe 2007:21). It is known that Pre-Columbian peoples harvested cacao in modest, garden-style plantings near forest streams, not to protect the trees from the sun, but to preserve the pollinator populations to produce greater quantities of fruit. As a result, small-scale plantings favored the number of pollinators contributing to a larger fruit set in T. cacao (Coe and Coe 2007; Bletter and Daly 2006:34-35).

Once the cacao flower becomes pollinated, each one of them produces a big cacao pod holding 30-40 seeds or “beans” which are covered in a sweet and juicy pulp (Coe and Coe 2007:21). The cacao pods are unable to open on their own since there is no natural system which will open the pods to cause the distribution of the seeds, therefore either humans (for domesticated cacao) or animals such as monkeys or squirrels (for wild cacao) who are in search for the pulp, become an important element in the seed dispersal of the cacao pods (Coe and Coe 2007:21-22). The cacao pods take between four to five months to grow and an extra month to mature fully and while the flowers can be pollinated all throughout the year, there are two main cacao harvesting periods (Coe and Coe 2007).
Ogata et al. (2006:69) have stated that the data collected so far mainly point to Mesoamerica as the center of cacao domestication (opening the cacao pod for seed dispersal by humans), but their results also suggest that some areas in South America could have been detached centers of domestication too. The main evidence has to do with the fact that the chocolate preparation (see Section IV for details) was created in Mesoamerica, because before humans realized they could make chocolate out of the seeds they used to only take the pulp which is sweet and juicy without having to undergo any kind of anthropogenic procedure which was later discovered as I explain in the subsequent sections (Coe and Coe 2007).

Cacao has a complex chemistry which varies by the part of the plant, its stage of maturation, and the manner of processing (e.g. fermenting and roasting) (Bletter and Daly 2006). Bletter and Daly (2006) have classified the pharmacological activity of cacao into three large categories: antioxidants (slow the oxidation of chemicals in the body by free oxygen radicals), neuroactives (cause changes in brain function), and stimulants (increase activity of the central nervous system and increase energy or awareness). In this last category, the three main stimulants (alkaloids or methylxanthines) present in cacao are caffeine, theobromine, and theophylline, all of which have significant physiological effects on humans (Coe and Coe 2007; Bletter and Daly 2006).

Cacao can also be addictive due to its abundant neuroactive components such as serotonin, tryptamine, anandamide, phenylethylamine, and dopamine which act with the brain’s natural neurotransmitters by replicating them, obstructing them, or slowing their destruction by enzymes to generate a psychological effect (Bletter and Daly 2006:47). Each of these compounds interacts on a different neurotransmitter and receptor system in the brain. For example, tryptamine, serotonin, and phenylethylamine affect the brain so that humans experience mood
changes and can also act as anti-depressants (Bletter and Daly 2006:47-48; Coe and Coe 2007). Further, phenylethylamine which stimulates the catecholamine neurotransmitter receptors like to amphetamines, is distinguished as the compound that accounts for the addictive properties of chocolate (Bletter and Daly 2006:48). Cacao also has antioxidants flavoroid phenolics which prevents the oxidation of LSD (bad) cholesterol, as well as quercetin known as both an antioxidant and anti-inflammatory (Coe and Coe 2007:31-32).

Cacao is mainly used as a fermented or unfermented drink made from its pulp or seeds. However, the cacao tree also has medicinal uses where for example, the leaf and bark are prepared as infusions, decoctions, or tinctures (Bletter and Daly 2006:59). Cacao has been used as a soothing agent, antiseptic, stimulant, snakebite remedy, or weight gain component and it is also used in psychoactive preparations in combination with other ingredients (Bletter and Daly 2006).

### III. Brief History of Cacao

"The upper class nobility and gentry of Mexico were great consumers of chocolate, and the best cacao was that of Soconusco. As a kind of pan-Mesoamerican money, cacao gained even more prestige. It was certainly an economic motivation, not desire for justice, which prompted Ahuitzotl to take Soconusco” (Coe 1961:17)

The history of cacao begins with the origin of the cacao tree in the northwest Amazon basin of South America in accordance with F. J. Pound’s origin hypothesis (further discussed in Section VI) (Ogata et al. 2006). At first, only the cacao pulp was used and humans began trading it going north towards the Soconusco, yet it was until 1800BC that the inhabitants of this region discovered how to turn the cacao seeds into chocolate (more details on the following section) (Coe and Coe 2007). As we will observe in Section V, the archaeological evidence on the usage of cacao in the form of a liquid drink points to the Mokaya culture during the “Barra” ceramic phase (1900-1700BC) (predating the Olmecs) in which their elaborate pottery is hypothesized by
Powis et al. (2008) to have been used for display of valued drinks, rather than cooking, in the form of social gatherings and feasts.

By the time the Olmec civilization rose (1500-400 BC) in the lowlands of the Mexican Gulf Coast, the preceding Mesoamerican inhabitants had already made chocolate well known to them (Powis et al. 2008; Coe and Coe 2007). Even though there is evidence found on Olmec writing (i.e. Cascajel Tablet) which is yet to be fully decoded, according to linguists Terrence Kaufman and John Justeson they spoke the Mixe-Zoquean language which introduced the word to describe cacao as “kakaw” (originally pronounced kakawa) (Coe and Coe 2007; Powis et al. 2008; Rodriguez et al. 2006).

During the Late Pre-Classic, the Olmec-derived Izapan culture located in the heart of the Soconusco region might have been the ones who spread the process of making chocolate to the rest of Mesoamerica (Yucatan, Tabasco, Gulf of Mexico region, and Guatemala highlands and northern lowlands) (Coe and Coe 2007). In the Popol Vuh (the sacred book of the Quiché Maya), cacao first appears in the form of seeds in market settings, but not as the liquid drink that it came to be and the Izapan were integrated in the Maya creation myths by foods like cacao which the gods found in the Mountain of Sustenance. Many of these Popol Vuh narratives are present in Izapan carvings on stone stelae at Izapa (Coe and Coe 2007:39).

At around AD 250 (Classic period), the lowland Maya flourished in major cities (Uxmal, Kabah, Chichén Itzá, and Copán) developing their art, architecture, and writings (hieroglyphs) in the form of codices where the Maya depicted ritual activities in which cacao was present (Coe and Coe 2007). The only written evidence for the use of cacao by the Classic Maya remains in elaborate painted and carved vessels at elite tombs, but there are still questions regarding who drank the chocolate, was it only the elite like with the Aztecs or was chocolate drank by the
ordinary Maya population (Coe and Coe 2007:42-43)? After AD 600 during the Late Classic period, tall ceramic cylinders were used as chocolate containers and were also used for the preparation of the chocolate drink as shown in the earliest known picture of the chocolate and froth-producing procedure on the Princeton Vase, thought to date from the 8th century AD and which may have originated in the Nakbé area of the north-central Petén (Figure 3) (Coe and Coe 2007:48).

After the Classic Maya collapse beginning around AD 800, the Chontal Maya or Putún from the Chontal zone of east Tabasco became productive cacao planters and controlled most of the coastal trade routes from north of the Chontalpa, in the Yucatan Peninsula, and all the way to the commercial centers near the Gulf of Honduras (Coe and Coe 2007:53). The increase in trade networks were stimulated by the use of cacao seeds as both a form of money and as a commodity.

The Toltecs became the dominant culture by the 10th century AD by defeating the Putún Maya and taking over both the Cacaxtla region and the Yucatán Peninsula (Coe and Coe 2007:55-56). The Toltecs had two capitals one located to the east at Chichén Itzá and Tula to the west from which they governed, further contributing to the blend of Maya-Mexican styles and cultures (Coe and Coe 2007). By this time, the primary cacao-producing lands were located in Chontalpa of Tabasco and in the Pacific coastal plain—that is, the Soconusco region—of Chiapas and Guatemala. This apparently incited nations like the Toltecs to fight over the control of many of these cacao-producing territories if they could not maintain good trading relations with the groups controlling them.

In the Yucatán Peninsula, where the environment is generally too dry for successfully growing cacao, some Maya communities began growing it in sinkholes or cenotes which had a
higher year-round humidity providing a sort of oasis for cacao growth in an otherwise inhospitable landscape. Depictions of this have been found at the Temple of Owls in Chichén Itzá (Figure 4), and even more striking is the continued presence of descendant cacao trees still growing in cenotes in the Yucatan Peninsula, as documented by Arturo Gómez-Pompa and his colleagues (1990) (Coe and Coe 2007:57-58).

By the 14th century AD, the Aztec economic structure was mainly composed of trading and tributes. Cacao became established by the Aztecs as currency for transaction as well as a precious commodity worth fighting for through warfare and controlling by trade or conquest (Coe and Coe 2007:68). The Aztecs trained large armies to engage in what became known as the “Guerra Florida” (Flowery War) and according to Michael Coe (1961) it was during the rulership of the Emperor Auhizotl (1486-1502) that the Aztecs decided to invade and take over the Soconusco region around 1500 due to its wealthy cacao plantations. The Aztec army first invaded the Mazatlan (later Mazatan) territory, moved on to Ayutla, finally arriving at Xolotlan whose inhabitants gave in without fight (Coe 1961). The Aztecs pardoned the inhabitants as long as they paid tribute and secured the boundaries against the neighbouring Maya polities such as the Quiché and Mam of Guatemala. The tribute list in the Codex Mendocino show that the Aztecs demanded tribute in goods from the Soconusco communities including 200 loads3 of cacao and 800 pottery vessels for drinking cacao (Coe 1961). Aware of this territory’s richness, the Aztecs acquired it and raised cacao’s prestige since the upper-class and nobility were able to consume the best chocolate from the Soconusco (Coe 1961). As a result, the Aztecs became the most dominant power controlling the cultivation, production, and distribution of cacao across Mesoamerica.

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3 A regular load of cacao in a trader backpack was around 24,000 beans (three xiquipillis).
There were four different types of cacao tree distinguished by the Aztecs: cacauhcacahuatl, mecacahuatl, xochicacahuatl, and tlalcacahuatl (Coe and Coe 2007). The way in which the Aztecs counted the amount of cacao beans was also unique since they did not count by weight but by number. Coe and Coe (2007), illustrate this with their description of the emperor Nezahualcoyotl’s annual expenditure of 2,744,000 cacao beans—some used for drinking cacao and some used for payments. The emperor Motecuhzoma Xocoyotzin had in his warehouse more than 40,000 loads or the equivalent to 960,000,000 cacao beans. Later on, the Emperor Motecuhzoma Ilhuicamina even created sumptuary laws in which only those who would go to war could wear cotton, feathers, smoke, and drink cacao (Coe and Coe 2007). Since the pochtecas or merchants were considered warriors too they would host banquets with huge quantities of chocolate drink as a way to ascend the socio-economic ladder (Coe and Coe 2007).

Just as the Aztecs conquered the Soconusco area, in part to control the production and distribution of the cacao plantations, so too did the Spanish as they expanded their conquest beyond the central Highlands of Mexico (Coe 1961). Spaniard Pedro de Alvarado, accompanied by 300 Spanish and 300 natives soldiers, arrived to the Soconusco region in 1523, finding no resistance from the estimated 15,000 inhabitants (Coe 1961). Almost immediately, however, the population of the Soconusco, as elsewhere in Mesoamerica, was devastated by the introduction of new diseases, especially smallpox and measles, leading to the rapid decline of cacao production and trade (Coe 1961).

IV. Preparation of Chocolate Beverage

“...and from time to time they brought him [Motecuhzoma] some cups of fine gold, with a certain drink made of cacao...I saw that they brought more than 50 great jars of prepared good cacao with its foam, and he drank of that; and that the women served him drink very respectfully...” ~Bernal Díaz del Castillo

Before explaining the main steps required for cacao preparation into the liquid chocolate beverage, I should point out (following Bletter and Daly [2006]) that the Pre-Columbian use of
stimulants such as cacao and many other plants was almost universal throughout the Americas. In South America, humans found many plant species which were easy to consume by simply steeping in water, ingesting, or smoking to obtain the stimulating effects of the plant–examples include: yerba mate, guayusa, guarana, yoco, coca, and tobacco (Bletter and Daly 2006). Most of these plant species did not require elaborate preparation processes in order for people to acquire the desired stimulant effects. In contrast, the process required for cacao preparation is far more elaborate and time consuming as we will see below.

It has been suggested (Coe and Coe 2007; Bletter and Daly 2006) that the juicy and sweet pulp that surrounds the bitter cacao seeds within the cacao pod might initially have been eaten by both animals (such as monkeys and squirrels) and humans in the Amazon region–where wild cacao trees grow. Powis et al. (2008) and Joyce and Henderson (2006) have proposed that humans realized they could ferment the sugary pulp surrounding the seeds and drink the resulting alcoholic cacao beverage during community feasts. This idea is based partly on the recent residue evidence from ceramic vessels found at sites in Mesoamerica, a topic I will discuss in detail in the next section. While this new hypothesis seems reasonable, particularly because there is a long tradition of plants being used for alcoholic beverages (e.g. pulque made from maguey plants and maize beer, *chicha*) (Powis et al. 2008), further research must be carried out. So far there is no conclusive evidence or explanation of the process whereby humans may have produced an alcoholic cacao drink before the emergence of the chocolate beverage later consumed by Mesoamerican societies (Joyce and Henderson 2006).

The process for chocolate preparation involves four main steps the cacao seeds must go through: fermentation, drying, roasting (or toasting), and winnowing (Coe and Coe 2007:22-24). The cacao seeds are first fermented along with the pulp between three to five days (depending on
the kind of cacao tree used either criollo or forastero cultivars). The criollo type takes less time to ferment and on the first day the pulp becomes liquid and drains as temperature increases while the seeds sprout and later die due to the high temperatures and acidity. This has to happen in order for the cacao beans to produce a chocolate flavor. The cacao seeds are turned occasionally throughout this fermentation period and kept at temperatures between 40°C to 50°C. In short, the fermentation step lowers the astringency of the cacao seeds so that they are no longer bitter (as when taken originally from the cacao pod) and gain a pleasurable and attractive chocolate taste which humans can consume.

Once the cacao beans are dry after spreading them on mats or trays in the sun for one to two weeks, these lose more than half of their original weight and are consequently roasted at 99°C to 114°C to produce chocolate, or 116°C to 121°C for cocoa power (Coe and Coe 2007:24). The last step, winnowing consists of peeling off the thin cacao bean shell since it is useless for producing chocolate. Once winnowed, the beans can be ground to create a chocolate paste or powder used in making a chocolate beverage. This four-step process is the same regardless of the different technologies employed and it has been used for at least three millennia right up to the present day (Coe and Coe 2007:23).

Only a few accounts survived describing the way in which chocolate was prepared by Mesoamerican cultures such as the Maya and later on by the Aztecs (Coe and Coe 2007). Both cultures prepared multiple drinks involving chocolate along with other ingredients such as: chilli, vanilla, ceiba seed, hueinacaztli (“great ear” type of flower), mexcaxochitl (“String flower”), Magnolia Mexicana, izquixochitl (“popcorn flower”), achiote, and pimienta (black pepper). The Aztecs also made a mixed drink with maize or nixtamalli and it was known to be an inferior or less prestigious drink mainly consumed by the commoners, while the main chocolate drink was
consumed by the Aztec elite (nobility, lords, royal house, long-distance merchants, and warriors; but not priests). These Aztec elites would drink it at the end of the meal (usually accompanied with tobacco) during banquets as well as at ordinary meals (Coe and Coe 2007).

One of the main differences between the chocolate drink consumed by the Maya and the Aztecs was that the Maya used to drink the chocolate hot, while the Aztecs served it cold, a distinction noted by the Spaniards when they arrived at Tenochtitlan (Coe and Coe 2007). The accounts of Spaniards such as Hernán Cortés, Bernal Díaz del Castillo, Bernardino de Sahagún, among others, discuss the utensils used by the Aztecs to make chocolate, including golden, silver, or wooden spoons to mix the drink and create thick foam. However, there is no mention in the historic records of people using wooden beaters or swizzle sticks (Spanish molinillo) or of pouring the chocolate from one vessel to the other to create the highly valued foam (Hurst et al. 2002). This last method is, however, known from the Codex Tudela where there is a drawing of an Aztec woman pouring chocolate from above into another vessel—the same process depicted on the Princeton Vase (Maya) dating to eight centuries earlier (Figure 5) (Coe and Coe 2007:86).

Once established in Mesoamerica, the Spaniards did not find the indigenous cuisine appealing and began to influence the Aztec cuisine using spices and ingredients brought from the Old World (Coe and Coe 2007). In the case of the chocolate drink, it underwent a transformation so that this chocolate “mestizo” drink had sugar, cinnamon, black pepper, and was served hot to make it drinkable for the Spaniards. The Spaniards took this new “creolized” recipe to the Old World where it quickly spread throughout Europe by the sixteenth century (Coe and Coe 2007). This is the version of the chocolate drink we know today.

V. Origins of Cacao Use: Archaeological Evidence
“...and then they ended with the chocolate [cacahuatl]. To carry it one placed the cup in this right hand. He did not go taking it by its rims, but likewise went placing the gourd in the palm of his hand. And then stirring stick and gourd rest he went bearing there in his left hand. These were to pay honor to the lords. But those who followed, all [were served with] only earthen cups...” ~Bernardino de Sahugán
Due to the complexity of *T. cacao*’s geographical distribution, extent of human intervention in distribution and domestication, and interbreeding between taxonomic subspecies which must have taken place during the Pre-Columbian period (Ogata et al. 2006) archaeological evidence of cacao has become a crucial line of evidence in examining the origins of the chocolate-making process and consumption by the early inhabitants of Mesoamerica. As previously described, since chocolate was served by pouring the liquid from one vessel into another by the Maya and the Aztecs, the analysis of organic residues in ceramic vessels is elemental in the study of cacao (Hurst et al. 2002). Techniques have been developed in recent years to test the evidence of cacao residues in ceramic vessels found at various sites across Mesoamerica (Prufer and Hurst 2007).

Since archaeologists have found evidence on the development of ceramics early on in villages across Mesoamerica—especially in the Soconusco region—ceramic technology, designs/forms, and ceramic functions have been considered in the search for evidence of cacao preparation and consumption (Figure 6) (Powis et al. 2008). Many of the ceramic vessels recovered at Mesoamerica’s earliest village sites provide little or no evidence of cooking, but rather they seem to have been used for holding liquids (Clark and Cheetham 2002). These vessels may have been used for serving liquids such as *chicha*, chocolate, or *atole* known to be consumed in social settings as a way to confer prestige at feasts. In order to test this, and look for evidence of cacao in early vessels, Terry G. Powis and colleagues (2008) decided to sample sherds from ceramic vessels found at early Mesoamerican sites from both the Soconusco and the Gulf Coast regions to explore the possibility of chocolate consumption by Mexico’s earliest inhabitants as early (as 1900 BC) during the Barra Ceramic Phase [1900-1700 BC] in the Soconusco).
To test their hypothesis, Powis et al. (2008) carried out residue analyses on a number of sherds from ceramic vessels from both regions including five sites: San Lorenzo, Canton Corralito, Paso de la Amada, El Manati, and El Paraiso. The sherds used were specifically selected from Early Formative contexts including a wide range of ceramic types as well as forms (Powis et al. 2008). It was hoped that this diverse sample might reflect the wide-range of vessels which may have been used in different parts of the cacao preparation process such as: preparation, presentation, storage, and consumption.

The techniques used by Powis et al. (2008) to develop this chemical analysis on the ceramic vessels were first introduced by the chemist Jeffery Hurst and he used high-performance liquid chromatography (HPLC) coupled to atmospheric-pressure chemical-ionization mass spectrometry (MS) (Hall et al. 1900; Hurst et al. 1989; 2002; Henderson et al. 2007). The vessels were scraped to remove any substances which could have permeated the inner walls and then a small sample (1-5 grams) of the clay material was collected from each vessel and sent to the Hershey Foods Technical Center for analysis to take place. In order to successfully perform the high-performance liquid chromatography coupled to atmospheric-pressure chemical-ionization mass spectrometry, 500mg from each sample were mixed with three milliliters of hot distilled water at 80 degrees centigrade to achieve solubility. Powis et al. (2008) used a Shimadzu QP-8000 LC/MS system to analyze the samples and since cacao is known to be the only Mesoamerican plant species that has theobromine as its prime methylxanthine, this method was precisely calibrated for the identification of theobromine in the samples from 117 sherds. The system operates through a positive-ion mode to monitor the peaks at m/z=181 for theobromine and m/z-195 for caffeine with the ultraviolet detector set at 270nm (Powis et al 2008; Hurst et al. 2002; Henderson et al. 2007; Hall et al. 1990).
The results confirmed the presence of cacao (*theobromine*) in two of the 117 vessels analyzed (Powis et al. 2008). One of the sherds came from Structure 4 in Mound 6 excavated at Paso de la Amada by Michael Blake (Powis et al. 2008). This vessel was identified as a brown slipped tecomate (Bayo Brown ceramic type) and has been dated within the Barra and the Locona Phases between 1900 and 1500 BC (Powis et al. 2008). The second vessel, a deep bowl with a wide horizontal line of red slip surrounding the base (Chaya Punctate ceramic type), came from El Manati which was recovered in Strata IX and X in a test pit (B4D3) (Powis et al. 2008). This vessel was found in association with a quantity of objects such as fine ceramics, stone mortars, green stone and jadeite axes, sculptures of wood, rubber balls, plants and seeds, and turtle and deer bones, which could have represented a ritual activity location during the Ojochi Phase (1650-1500 BC) (Powis et al. 2008).

We can highlight the significance of Powis et al.’s (2008) study for four main reasons. First they used the most recent technique to analyze and examine organic residues. Second, also this is the first attempt to identify cacao use by the Mokaya people, one of the earliest documented village societies in Mesoamerica (see Clark and Blake 1994; Blake et al. 1995; 2006). And finally, the study points to the idea that pre-Olmec (ca. 1650BC) people in the Gulf Coast area were also actively involved in the production and consumption of chocolate and consequently the Olmec were also fully familiar with cacao (Powis et al. 2008; Henderson et al. 2007).

Henderson et al. (2007) performed a similar chemical analysis on cacao residues from thirteen ceramic vessels recovered at the site of Puerto Escondido in the lower Rio Ulua Valley, Honduras. Their excavations found indications of domestic activity before 1500 BC (Henderson et al. 2007). They recovered ceramic sherds from early levels in two separated excavation areas from different groups of buildings and selected the samples in order to include a variety of vessel
forms/shapes and decorations, especially the ones that would be more likely for serving and drinking cacao or any liquid beverage.

Henderson et al. (2007) analyzed the samples using liquid chromatography (LC)-MS and GC-MS (similar to Powis et al. 2008) and eleven of the thirteen vessels tested had theobromine and/or caffeine. The earliest sample (4DK-136) which had residues of theobromine was from a sprouted bottle dating to the Ocotillo phase (ca.1400-1100 BC). The vessel’s form is different from the Middle Formative samples (such as 8K-31) due to its separate spout and flaring neck which indicates that serving cacao may have been done differently in the earlier Ocotillo period than in later times (Henderson et al. 2007:18938). Their research suggests a long and early history of serving and drinking cacao at special ceremonies and rituals such as marriages, births, and other celebrations—a set of activities that helped to build social relations both within and beyond the ancient community of Puerto Escondido (Henderson et al. 2007).

An earlier search for cacao residues was carried out on pottery recovered at the Pre-Classic Maya site of Colha in Northern Belize (dating back to 600BC) (Hurst et al. 2002). Using an earlier version of their methodology already described for the more recent work, Hurst et al. (2002) sampled dry residues from 14 ceramic vessels recovered from burials at the site and dating between 600BC and AD 250. Theobromine was identified in 3 of the 14 vessel samples analyzed. Hurst et al. (2002) have concluded that chocolate must have been consumed by the Maya beginning at least in the Middle Pre-Classic and they no doubt passed the cacao tradition on to later generations extending all the way up to the time of the Spanish Conquest.

At yet another Maya site, Río Azúl in northeastern Guatemala, Hall et al. (1990) recovered 19 tomb offering vessels with excellent organic residue preservation. Hall et al. (1990) analyzed dry residue samples from 5 of the 19 vessels found in the tomb and discovered the two
compounds present in cacao: *theobromine* and caffeine. Vessel No. 15 contained cacao (both *theobromine* and caffeine); two tripod cylinder vases contained *theobromine*; the third vessel had a weak indication of *theobromine*; and a fourth vessel showed no indication for either of the two compounds (Hall et al. 1990).

In addition to the chemical analysis, vessel 15 contains evidence of hieroglyphs (15 separate glyph blocks) so an epigraphic analysis was developed by Hall et al. (1990). The epigrapher, David Stuart (2006), used the Primary Standard Sequence (PSS) to categorize vessel writing which follows sequence or a specific pattern of signs and deciphered the text as suggesting that it was in fact a “recipe” describing the content of the vessel (Figure 7) (Coe and Coe 2007). Two of the glyphs could have represented the word “ca-ca-wa” used to name cacao (Hall et al. 1990). Stuart also suggests that the series of glyphs could refer to the name of the owner of the vessel, the vessel “type,” and a description of the type of cacao used and the cacao recipe along with other ingredients (Hall et al. 1990). Hall et al (1990) conclude by drawing attention to the use of cacao in mortuary rituals associated with Tomb 19–an association that had not been documented previously.

In 1995, Prufer and Hurst (2007:273) encountered the mortuary Cave Bats’ub in Southern Belize where five cacao seeds (from the Early Classic Period fourth or fifth century AD) remained in a small bowl intact along with a “complex funerary offering accompanying a decapitated individual.” Since the burial chamber had been tightly sealed botanical preservation was excellent (Prufer and Hurst 2007:273). This context in which the cacao seeds were found, points to possible hypotheses regarding the use of cacao in mortuary and cave ritual scenarios. A topic I will return to below.
The cacao seeds were sent to the Hershey Foods Technical Center in Hershey, Pennsylvania for analysis where two seeds were examined using spectrographic analysis with high-performance capillary electrophoresis (HPCE)—unfortunately, they were destroyed in the procedure (Prufer and Hurst 2007:282). The results demonstrated that one seed had theobromine (Prufer and Hurst 2007:282). Neither of the two seeds contained caffeine probably due to their high levels of degradation and because the ratio of theobromine to caffeine in cacao is 10:1. While the second seed examined was morphologically analogous to the first seed, it was too much more degraded and so did not result yield a chemical signature for cacao (Prufer and Hurst 2007:282). Prufer and Hurst (2007) concluded these seeds could have been the “remnant populations of early domesticates.”

Due to the context in which the cacao seeds were recovered along with other offerings (i.e. a small stool), Prufer and Hurst (2007) suggest that cacao could have been an important element used by different Mesoamerican societies during rites of passage. Based mainly on ethnohistorical and ethnographic accounts regarding the use of cacao, it is known that cacao was used during weddings as something given by the bride to the bridegroom along with a small stool and coins, while the bridegroom would give skirts, coins, and cacao seeds to the bride in exchange (Prufer and Hurst 2007:286-287). Further, the Lacandon Maya had a custom of burying their dead in fields near their village placing stools and cigars in the men’s graves and grinding stones, chocolate cups, and so on in the women’s graves: hence cacao was and is still seen as a valuable element even in the afterlife (Prufer and Hurst 2007:287). Additionally, “cacao may have been an important possession of both men and women” and had an important role in rituals dealing with births (such as naming ceremonies) and “social recognition of personhood” (Prufer and Hurst 2007:287-288).
A surprising new discovery in New Mexico has revealed evidence of cacao consumption at Pueblo Bonito, in the Chaco Canyon (Hurst and Crown 2008). Since this is a location very far from the nearest region in southern Mexico where cacao trees grow (Figure 1), cacao must have been brought to the site by long-distance traders. Chemical analyses of ceramics from this site were carried out to test for the presence of cacao residues (Hurst and Crown 2008). The Chaco culture began around A.D. 900 with the development of multiple large masonry villages—Pueblo Bonito is the largest of these—which were involved in long-distance exchange and complex ritual organization.

Examining previously excavated ceramics from the Pueblo Bonito, Crown and Hurst (2008) sampled five sherds that were part of a collection of 111 ceramic cylinder jars, a pitcher, and an unidentified vessel found in just one room at the site, suggesting the possible use of these jars for ritual purposes (Crown and Hurst 2008). Dating between A.D. 1000 and 1125, the sherd samples were analyzed using HPLC coupled to MS. The results confirmed the existence of theobromine in three of the samples (cylinder jars), while the sherds from the pitchers and identified ceramic did not show signs of theobromine. This study provides new interpretations on the use of cacao in Pre-Columbian era. It shows the presence of cacao outside of Mesoamerica, far from the environmental range where cacao cultivation is possible (Figure 8). It also demonstrates that the cylindrical jars at Pueblo Bonito were specifically used for drinking chocolate (Crown and Hurst 2008). Further, this new evidence hints at a closer relationship between rituals performed at Pueblo Bonito and those carried in Mesoamerica (Crown and Hurst 2008).

All the analyses presented and discussed point to the usage of cacao for some kind of ritual purpose such as feasting, marriages, birth celebrations, and so on. This demonstrates cultural
significance of *T. cacao* as a prepared liquid drink for the inhabitants across Mesoamerica and communities far away such as Pueblo Bonito, a topic discussed in more detail in Section VII.

In order to illustrate the geographic distribution of archaeo-chemical evidence for cacao use, I have mapped all the known locations in southern Mexico and Central America (Figure 8). Most of the evidence of cacao use by Mesoamerican inhabitants has been found strictly in this area, with the exception of Pueblo Bonito in New Mexico. Besides considering the already performed archaeological studies in this area which evidently confirm the human use of cacao as early as 1900BC, through this paper I propose to carry on archaeological research beyond this geographical area for further analysis. Hence, the archaeological research may also be performed in other areas along Central America such as Nicaragua, Costa Rica and Panama, and towards Ecuador, Colombia, and Venezuela since there is still lack of archaeological evidence regarding the use and domestication of *T. cacao*.

VI. **Cacao Distribution Hypotheses**

“And so they [the gods] were happy over the provisions of the good mountain, filled with sweet things, thick with yellow corn, white corn, and thick with pataxte [Theobroma bicolor] and cacao…the rich foods filling up the citadel named Brocken Place, Bitter Water Place” ~Account on the Mountain of Sustenance in the Maya Popol Vuh

Now that the origins and the distribution on the use of cacao by humans as a chocolate beverage has been presented, I will discuss the origins of the cacao tree and its distribution across South and Central America—a process which must have occurred at an earlier time. The origins and distribution of *T. cacao* and the subspecies *cacao* has remained in controversy over the years due to the lack of data recovered from South America which is considered the “center of origin of the genus cacao” (Ogata et al. 2006:73).

Bletter and Daly (2006:35-36) discuss the possibility that *T. cacao* used to grow as a wild species in South America and then cultivated forms of *T. cacao* originated either in Mesoamerica (where humans developed the techniques of making chocolate as previously mentioned) or
northern South America based on Clement’s proposition that *T. bicolor* and *T. cacao* were semi-domesticated in the Upper Amazon during late prehistoric times and the seeds were consumed as stimulants. Bletter and Daly (2006:36) explain that cacao has low genetic diversity in Mesoamerica which could be due to a “relictual bottleneck or a more recent arrival via long-distance dispersal or trade”. In addition, there is little archaeological and ethnobotanical evidence that Amazonian groups cultivated cacao and used the seeds, hence Bletter and Daly (2006) admit more research is needed to prove any of the current origin hypotheses.

Even with all of these constraints, especially the lack of primary evidence on the origins of *T. cacao* and its distribution across South and Central America, but also the complicating factor of more recent human interference including the interbreeding of two *Theobroma* subspecies (Ogata et al. 2006), some scholars have proposed distribution plausible hypotheses for the origin and distribution of cacao. I will first introduce each of the possible distribution hypotheses and will propose a new distribution map that integrates some of the most recent data on the Pre-Colonial distribution of cacao. Some of these proposals could be tested in the near future by further exploring some archaeological sites in Central and northern South America (as I will suggest in more detail below).

As early as 1944, E.E. Cheesman hypothesized that humans acted as agents in the distribution of subspecies *cacao* starting in South America and moving towards Mesoamerica with a possible migration of two groups of subspecies *cacao*, one to Venezuela, and another one in the direction of Central America (Ogata et al. 2006:73). Cheesman based his hypothesis on F. J. Pound’s observations in his 1938 expedition in which he claimed to have found the origin of the cacao tree next to the Napo, Caqueta, and Putumayo rivers, all tributaries of the Amazon (Ogata et al. 2006:73). Cheesman concluded that since the species *cacao* has no system of
natural dispersal of its seeds and the seeds lose the ability to sprout rapidly once separated from the pod, humans would have possibly been the distributor agents taking the seeds over the Andean cordillera (Ogata et al. 2006:73).

A similar approach by Richard Schultes, who also considered humans as the transporters of *T. cacao*, was introduced with two possible cacao routes north and west from the mouth of the Amazon (Ogata et al. 2006:74). The first route (A) points to the migration of cacao from the Amazon progressively through the humid forested Atlantic Coast of northern South America passing by the Guianas, Venezuela, and reaching Colombia (taken by humans from the arid Caribbean coast to the humid region at the northernwest area of Colombia in the Gulf of Urabá) (Ogata et al. 2006:74). From there cacao would have migrated north to Panama, Costa Rica, Nicaragua, Honduras, Guatemala, and to southern Mexico (Ogata et al. 2006:74). The second route (B) also starting at the mouth of the Amazon suggests cacao could have followed the Rio Negro (Brazil) all the way up to the Casiquiare, the canal connecting the Amazon drainage region with the uppermost Orinoco River, and find its way to the coastal region of Venezuela (Ogata et al. 2006:74). According to Schultes, the required environmental conditions and vast rainfall for the successful growth and survival of the cacao tree would have been accessible throughout this route (Ogata et al. 2006:74).

A more recent approach has been made by Motamayor et al. (2002) through the study of the genetic diversity of Mesoamerican cacaos compared to those of South American samples by the application of restriction fragment-length polymorphism and microsatellite markers (Ogata et al. 2006:75). In short, Motamayor et al. (2002) encountered very low diversity in the Mesoamerican samples which discounts the possibility of these subspecies being wild, such as the species found in Peru, Colombia, and Ecuador. This means that all Mexican varieties of
cacao are recent domesticates and varieties such as the one found in Lacandon forest region of Chiapas, Mexico therefore “should be considered neither wild nor as originating from this region” (Ogata et al. 2006:75; Motamayor et al. 2002). Additionally, by using the evidence of lack of *T. cacao* pollen in samples from the “Tertiary period deposits” as well as the existence of very old human settlements in the region, Motamayor et al. 2002 have proposed that Lacandon cacao populations are the “remnants of cacao cultivated by the Maya” (Ogata et al. 2006:75ñ Motamayor et al. 2002).

Different from the previous hypotheses, Pittier proposed in 1935 a natural distribution of *T. cacao* populations rather than the human transportation of cacao towards Mesoamerica (Ogata et al. 2006:75). Pittier suggested the presence of three different cacao species in his distribution hypothesis: *T. cacao*, *T. pentagonum*, and *T. leiocarpum* in which the first two are categorized as subspecies *cacao*, while the latter corresponds to subspecies *sphaerocarpum* (Ogata et al. 2006:76). For Pittier, *T. cacao* migrated naturally from the northwestern part of South America to Central America, while *T. leiocarpum* “indigenous” to the northeastern part of South America travelled all the way to Central America (Ogata et al. 2006:76). Cuatrecasas agreed with Pittier’s distribution hypothesis and thought that *T. cacao* was naturally distributed from “Amazonia-Guiana westward and northward to the south of Mexico” (Ogata et al. 2006:76). Nonetheless, this hypothesis has been discounted (as mentioned before) by the recent genetic discovery provided by Motamayor et al. (2002).

By 1990, the specialists Gomez-Pompa, Flores, and Aliphat-Fernandez began to examine the sinkholes or *cenotes* in the Yucatan Peninsula and fused the Pittier and Cuatrecasas distribution propositions to develop their own distribution hypothesis (Ogata et al. 2006:77). Gomez-Pompa et al. argued that subspecies *cacao* naturally arrived to the southern Lowlands of
Mexico and became domesticated later on by the Mesoamerican inhabitants (Ogata et al. 2006:77). In addition, De la Cruz et al. (1995) and Whitkus et al. (1998) compared the genetic diversity of *T. cacao* in southern Mexico to samples recovered in the Yucatan Peninsula and the Lacandon forest through random amplified polymorphic DNA markers, and the results demonstrate a distinctive segment of genetic diversity in Mesoamerica that originated with at least one of the South American populations (Ogata et al. 2006:77).

An even more recent distribution hypothesis also using genetic analysis based on archaeological data has been proposed by Ogata et al. (2006) to reach a better understanding on the distribution of *T. cacao*. Ogata et al. (2006:77) use ecology, ethnobotany, and molecular data to analyze samples of “old, abandoned, and putative wild populations of cacao from southern Mexico.” The samples came from cacao producer towns during the Pre-Columbian times referred to in the document *Suma de visitas de pueblos* which contains accounts gathered between 1531 and 1544 from 907 towns in Central Mexico (Ogata et al. 2006:78). Another set of samples also were taken from cenotes in the Yucatan Peninsula and all the samples were gathered with the help of local people from Campeche, Quintana Roo, and Chiapas (Ogata et al. 2006:78).

Ogata et al. (2006:78) created haplotypes on populations identified representing subspecies of *cacao* and analyzed them by using statistical parsimony, which “estimates the maximum number of differences among haplotypes as a result of single substitutions with 95% confidence.” The results of this genetic analysis point to the idea that wild cultivars from the tropical rainforests of Mexico are in fact the “source of cacao cultivated there since pre-Hispanic times,” with the most elevated number of haplotypes in Oaxaca and southern Veracruz due to the intensive cultivation in this region at the time of the Conquest (Ogata et al. 2006:80). For a visual
explanation of this methodology refer to Figure 9 and 10 of distribution of the haplotypes based on the statistical parsimony analysis. In short, this analysis illustrates that there was a “wide natural distribution of subspecies *cacao* in the neotropics” (Ogata et al. 2006:80). This hypothesis contradicts Motamayor et al.’s (2002) conclusions since Ogata et al. (2006) propose (A) that there is enough genetic differences to consider the *criollo* and *forastero* cultivars subspecies *cacao* and (B) that the distribution of cacao took place through natural forces instead of by anthropogenic forces. However, Ogata et al. (2006) admit there are more samples needed from Central and South America to further confirm this genetic analysis and to provide further evidence regarding the early distribution of cacao.

Since the cacao tree needs very stable and consistent environmental conditions as discussed in Section II, such that the tree will successfully grow in the lowlands within the neotropics at elevations lower than 1000 meters and more commonly at around 300 meters or less, I propose a different approach to the previous distribution hypotheses along with a new map (Figure 11) which shows the potential distribution of cacao from South America to Mesoamerica by following a pathway through *elevations* lower than 1000 meters starting at the upper Amazon where cacao is proposed by F. J. Pound to have originated, moving towards the eastern side of South America, traveling by the eastern coast upward towards Venezuela and Northeast Columbia, and traveling further up to Central America (Panama, Costa Rica, Nicaragua, Honduras, Belize, Guatemala) passing through both sides of the coast all the way to Southern Mexico to reach the Soconusco region by about 3500 to 4000 years ago. The distribution may have been achieved through human intervention by cultivating the cacao tree along the lowland regions of South and Central America, rather than the transportation of the cacao seeds across the Andes as others have proposed.
Given that this is somewhat a newer version of Schultes’ distribution hypothesis, I acknowledge further research must be conducted in order to find archaeological evidence that could be used to test this hypothesis. I recommend starting by testing early pottery from places such as lowland Venezuela, Colombia, Panama, and Costa Rica, to see if they have the telltale chemical signature for *theobromine* and caffeine. To my knowledge, there have been no archaeological residue studies carried out on early pottery from northern lowland South America. This would be an especially important research endeavor considering that it is precisely these geographic regions that have some of the earliest evidence of pottery in the New World—earlier 1500 years than the earliest Mesoamerican pottery.

**VII. Cultural and Ritual Significance of Cacao in Mesoamerica**

“The form of the marriage is: the bride gives the bridegroom a small stool painted in colors, and also gives him five grains of cacao, and says to him ‘These I give thee as a sign that I accept thee as my husband.’ And he also gives her some new skirts and another five grains of cacao, saying the same thing” —Eric Thompson on the Chol Maya of Chiapas

There is much evidence, in the form of depictions and hieroglyphs found at Maya lowland sites, showing the ritual and cultural functions of cacao, especially from the Classic Period (A.D. 250-900) up to the Colonial era (AD. ca. 1542-1820) (Coe and Coe 2007; Martin 2006). Later Maya *Codices* in which the Maya depicted the presence of cacao use ritual activities, also provide a significant source of information about cacao’s cultural significance. Paintings and carvings found at elite tombs evidencing the Maya use of cacao (Coe and Coe 2007).

Inscribed vessels most commonly cylindrical vases or deep, rounded bowls, especially the ones found in the Late Classic period, have been recognized almost exclusively as containers for cacao, while lower, less shallow bowls (many times globular in shape) were usually used for *ul* or *atole* maize gruel, tamales, and other maize solid foods (there are some exceptions to this pattern) (Stuart 2006, Coe and Coe 2007). Thus, the shape of the pottery analyzed has become
useful for specialists to find the “recipe” glyphs by using the PSS (Figure 7) (Stuart 2006; Coe and Coe 2007:46).

These “recipes” written on the outside of Maya vessels can be recognized because the Maya and other Mesoamericans were aware of the variety of chocolate beverages mainly evidenced in the already deciphered labels in some vessels, in codexes, as well as in ethnohistorical sources (Stuart 2006). In this sense, there are similar as well as different chocolate descriptions and categories expressed by the Maya and the Nahua, yet it is important to stress there is a lot more work to be done in the decipherment and interpretation of chocolate-related terms in ancient sources (Stuart 2006).

The *kakaw* glyph, deciphered by Lounsbury in 1974 using the Dresden and Madrid codices, has been recognized in direct relationship with depictions of gods holding bowls of cacao pods and cacao beans (Stuart 2006). Many vessels have the label for cacao used in conjunction with modifiers describing the flavor or condition of the cacao (Stuart 2006). As a result, Stuart (2006) has found many examples of ceramic vessels which contain the word *sakha’* (meaning either *atole* or a basic structure for different mixtures of ingredients), but has focused on the vessels containing the glyphs for *y-uk’ib’* and *kakaw* together (“it is his/her drinking cup for cacao”) inscribed on Maya drinking vessels.

For instance, Stuart (2006) encountered a vessel (K2227) with an interesting combination of references to cacao and *atole* with the inscription “for chocolatey atole” (*ti kakawak ul*), in which case cacao was used as a supplement to another liquid base (maize gruel). Other examples range from an Early Classic period incised vessel, the “lock top” pot from Tomb 19 at Rio Azúl (on Section V), vessel K625, offerings portraying cacao in ceramics at Copán, the Berlin vase found at Nakbé (Figure 3), among others (Stuart 2006; Coe and Coe 2007; Hall et al. 1990). In short, it
has been recognized that the vessels were used for both production and consumption of cacao in Maya palaces (Coe and Coe 2007).

According to Stuart (2006), people first began to inscribe labels on drinking vessels in the Petén region of northern Guatemala—especially in centers like Uaxactún and Tikal—and adjacent areas of Mexico and Belize starting in the Early Classic Period (A.D. 250). Similarly, at Copán in Honduras there is a unique idiosyncratic style of inscribing elite chocolate vessels encountered in the Late Classic period; while in Palenque there is little evidence of this practice which implies that the ceramic tradition was fairly isolated at this site from the developments in pottery in the central Petén sites (Stuart 2006).

Common pan-Mesoamerican themes in Maya art and writing that refer to cacao have been identified by scholars like Martin (2006). These range from fertility and sustenance to sacrifice and regeneration and to embodiment and transformation. The Maya used cacao as a status marker, since it was consumed mainly by the elite, and they also used it as currency as did the Aztecs (Martin 2006; Coe and Coe 2007). Bishop Landa described the importance of cacao drinks in Maya rituals and feasts including events such as merchants throwing huge parties, Maya baptisms, Festival to gods Ek Chuan, Chac, and Hobnil, and marriages (Coe and Coe 2007). In this sense, there is a connection between the hieroglyphs written on Maya ceramic vessels with the words for cacao drinks, the images depicted on vessels, capstones, and temple walls, and the use of cacao by the Maya described by the Spanish during the Colonial Period, as well as the archaeological analyses and interpretations based on the evidence for the use of cacao. In sum, various types of evidence all link cacao to rituals, cultural activities, and religious symbolism.
For example, a stone bowl from the Early Classic Period (A.D. 250-600) (Figure 12) has three carved circular plates containing images, a hieroglyphic caption and more text. The images are scenes of a male individual in various positions on a mat-decorated seat, with limbs attached to cacao pods, and his skin inscribed with “wood” designs suggesting the image is possibly an anthropomorphic tree (Martin 2006:154-155). The male individual also has particular physical characteristics: “sloping brow, tonsured hairstyle, prominent forehead jewel” which identify him as a Maize God and this leads to the possibility that the Maize God Tree has been embodied by or coated in cacao (Martin 2006:155). This is just one of depictions in which the Maya Maize God is shown in direct association with cacao, yet Martin (2006) proposes the cacao-maize relationship must be examined carefully taking into account multiple images if we are to understand it better.

Martin’s (2006) hypothesis on the Maya theme of decomposition and transformation is present in the Berlin vase and in the Palenque sarcophagus which strongly resonates with the mythology of Central Mexico and a description of sixteenth-century Histoyre du Mechique, in which the Maize God buries himself in the floor of a cavern and from his body grows corn, fruits, and seeds of useful plants. Cacao was considered one product of the Maize God’s “death”, an event of “universal fruitfulness” with greater implications for human sustenance than corn or cacao alone, thus the growth of fruit trees can be considered part of the notion of generational rebirth (Martin 2006). In Mesoamerican religions there is a belief that humanity is composed of corn dough and the life cycle of the Maize God serves to “re-process” the material from which all people are made (Martin 2006).

Another example of cacao associations with Maya religion and mythology are the images on vessel K631 in which cacao pods painted in a scene of God L (Lord of Underworld) show an
anthropomorphic tree with cacao pods like on the Berlin vase (Martin 2006). God L is related with cacao wealth as well as having ties to commerce and long-distance trade (depicted in murals at Cacaxtla, Mexico and narrative in the *Popol Vuh*) (Figure 13). There is also a link between lightning (K’awiil) and human sustenance (Maize God) in central Mexican mythology (Codex Chimalpopoca) as well as Maya accounts which are portrayed in vessel K631 where K’awiil carries a cacao sack with “kakaw” glyphs (Martin 2006).

This is a similar theme illustrated in the capstone at the Temple of the Owls, Chichen Itza in which cacao pods hang from the heavens and the Underworld (growing naturally on both places) and this has been interpreted as a representation of the cacao production in *cenotes*, having the origins of cacao not on Earth but in the Underworld which then was taken to heaven and earth (Figure 4) (Martin 2006). Hence, there is a direct connection between the images at Temple of Owls and vessel K631 (Martin 2006), both showing cacao as a sacred tree which is related to the Underworld and the God L and taken to earth for the sustenance of humankind.

The Aztecs treated cacao as a symbol during rituals recognized in the Codex Féjérváry-Mayer where cacao is drawn in a cosmic diagram as the “Tree of the South”, “direction of the Land of the Dead” and was associated with the color red, with a macaw bird as a symbol of the hot lands from which cacao came, and to the side standing was Mictlantecuhtli (Lord of the Land of the Dead) (Coe and Coe 2007), similar to the Maya associations between God L, the Underworld, and cacao. According to Thompson, the cacao pod was used in ritual as a symbol for the human heart torn out and sacrificed since both were holding precious liquids: blood and chocolate (Coe and Coe 2007). The evidence comes from a ritual performed by the Aztecs once a year where a slave impersonated Quetzalcoatl for forty days—and was treated as a god—and on the last evening he had to be sacrificed after performing a dance showing joy about his final
destiny, but if he was feeling sorrowful the temple elders prepared a chocolate drink

(itzpacalatl)\(^4\) for him before his performance one which would cheer him up (Coe and Coe 2007:104).

**VIII. Conclusions**

“Oh, divine chocolate!
They grind thee kneeling,
Beat thee with hands praying.
And drink thee with eyes to heaven.” ~Marco Antonio Orellana

As seen throughout this paper, cacao has been a very important species for the inhabitants of Mesoamerica as early as 1900BC when they discovered the process of turning the cacao seeds into chocolate which they began producing as a chocolate liquid drink. Cacao was used by the Mokaya (and possibly by other pre-Olmec Gulf Coast communities) who may have transmitted the chocolate making process to the Olmec, and later on many other Mesoamerican societies began consuming chocolate as part of their lives.

The Maya used chocolate as a drink served at feasts, rituals (births, marriages, etc.), used the cacao seeds as currency, and created associations between cacao and their deities and religious mythology, all which can be reflected in their multiple hieroglyphic work in vessels, capstones, temple walls, codices, the *Popol Vuh*, and Spanish Colonial accounts. The Aztecs conquered the best productive region for cacao growth in the Soconusco so that Aztec elite could drink chocolate at their feasts, warriors would drink it during war times, and the Emperor hoarded sacks full of cacao beans (not just for drinking but as currency). The Aztecs also maintained a symbolic connection between cacao and religious rituals as priests used the chocolate drink in association with sacrificial rituals (the cacao pod being analogous to the human heart).

The recent archaeo-chemical analyses of residues on ancient pod sherds performed by various scholars (Powis et al. 2008; Henderson et al. 2007; Hall et al. 1990; Hurst et al. 2002;)

\(^4\) Water from the washing of obsidian blades.
Crown and Hurst 2008; Prufer and Hurst 2007) who have studied collections from Mesoamerican sites and at Pueblo Bonito, in New Mexico, point to the possibility of better understanding the origins of use of cacao in the Pre-Columbian era. The use of high-performance liquid chromatography coupled with atmospheric-pressure chemical-ionization mass spectrometry for the identification of cacao residues in ceramic vessels has been successful thus far and has proven to work well for these kinds of analyses. Nonetheless, it should be highlighted that no one else has provided a different and new method for the analysis of cacao residues in pottery. Perhaps new techniques will either strengthen or possibly even call into question the previous methodology initiated by Hurst in the Hershey Foods Technical Center. Thus, there is more research to be done in the near future, first in terms of providing more kinds of techniques for chemical analysis of organic residues as well as more archaeological analyses of ceramic vessels recovered at other sites in Central and South America such as Panama, Costa Rica, Venezuela, and Colombia.

The origins and distribution of cacao has also been controversial since there is lack of archaeological data which means there is still a lot to be done in this regard. Multiple distribution hypotheses have been proposed by many scholars (Bletter and Daly, Ogata et al, Cheesman, Schultes, Motamayor et al, Pittier, Cuatrecasas, Gomez-Pompa et al, De la Cruz et al. and Whitkus et al.), some have proposed a human aided distribution of cacao, and others have used proposed both natural and anthropogenic forces to explain the distribution of cacao from the Upper Amazon region all the way north to the Southern region of Mexico. None have yet been proved so the opportunity to make a significant contribution to this research question is still at hand.
My distribution hypothesis makes use of the natural topographic elevation of South and Central America to create a pathway possible for cacao’s distribution by following the elevations in which cacao could have grown which tend to be up to 1000m but more commonly around 300m or less. This distribution starts at the upper Amazon, crossing South America traveling towards the eastern side all the way to the Atlantic coast, moving by the eastern coast northward towards Venezuela and Northeast Columbia, and traveling further up to Central America passing along both the Pacific and Caribbean sides of the coast all the way to Central and Southern Mexico reaching the Soconusco and the Gulf Coast regions by the beginning of the Early Formative period (Figure 11). In order to test this hypothesis, archaeological and botanical (especially genetic) research should be done through this pathway to confirm this new possible distribution of cacao.

Even though more work must be carried out since not all questions have been answered by the current archaeological, ethnohistorical, ethnographical, and iconographic research, we can state that cacao has been shown to be a very significant element in Mesoamerican societies. This has been demonstrated by its importance in consumption, for currency and material exchange, as well as for symbolic and religious associations. The hieroglyphs written on ceramic vessels with the words for cacao drinks, the images depicted on vessels, capstones, and temple walls, the use of cacao described by the Spanish during the Colonial Period and other texts such as codices and the Popol Vuh, and the archaeological analyses and interpretations on the evidence of cacao use, demonstrate that cacao was significant for ritual and cultural purposes as well as having an important religious and mythological symbolisms for Mesoamerican societies.
Figure 1: Map of the major cacao growing-zones (based on McNeil 2006) and the possible origin of the cacao cultivars according to Motamayor et al. (2002).
Figure 2: A cacao tree in Comalcalco, Tabasco, Mexico. The pods grow directly from the trunk.

Figure 3: A woman pours chocolate from one vessel to another in this palace scene from the Princeton Vase, Late Classic Maya (c. AD750). This is the earliest depiction of the froth-producing process (Coe and Coe 2007).

Figure 4: K’awiil’s flight from the Underworld. Reconstruction of a painted capstone. Late Classic or Postclassic period. Temple of the Owls, Chichen Itza, Mexico (Martin 2006).
Figure 5: Europeanized but accurate watercolor of a high-ranking Aztec woman pouring chocolate to raise foam, from the late 16th-century Codex Tudela.

Figure 6: Early Mokaya use of cacao: tecomate vessel (inset) which was found to contain cacao residue. This is one of 16 excavated from site of Paso de la Amada in southern Chiapas, Mexico, dating between 1900-1500BC (Powis et al. 2008).

Figure 7: An example of the PPS from a Classic Maya vase (Coe and Coe 2007).
Figure 8: Map of the Mesoamerican sites that present evidence of cacao use, including Pueblo Bonito in New Mexico.
Figure 9: Maximum number of steps connecting the haplotypes parsimoniously. Numbers after the localities correspond to the number of individuals sampled. Letters represent the main groups of haplotypes (Ogata et al. 2006).

Figure 10: Distribution of haplotypes based on statistical parsimony analysis (Ogata et al. 2006).
Figure 11: Map on the distribution of cacao based on an elevation model. The colors represent elevation ranges: light yellow 0-299m; light green 299-599m; dark green 599-1000m. The red line shows the possible distribution routes of cacao through the cultivation of the cacao tree by humans along the lowlands of South and Central America eventually reaching southern Mexico.
Figure 12: The Maize God as an embodied cacao tree. A. The seated god points to what may be a chocolate pot. B. The Maize God points to an open codex. C. Text naming the human protagonist as a “Maize Tree” (F2). Unprovenienced stone bowl (K4331). Early Classic period. The Dumbarton Oaks collection, Washington, D.C. Drawings by Simon Martin after a painting by Felipe Davalos in Coe 1975 and a photograph by Justin Kerr (Martin 2006).

Figure 13: God L with merchant’s pack and cacao tree. Mural detail. Late Classic period. Red Temple, Cacaxtla, Mexico. Drawing by Simon Martin after a photograph by Enrico Ferorelli (Martin 2006).
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