

ICONOGRAPHY OF THE FLORA DEPICTED IN THE
MIXTEC CODEX ZOUCHE-NUTTALL

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Timothy M. Herrera

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Thesis Supervisor:

F. Kent Reilly, Ph.D.
Department of Anthropology

Second Reader:

Robert Williams, Ph.D.
Department of Anthropology

Approved:

Heather C. Galloway, Ph.D.
Dean, Honors College

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TABLE OF CONTENTS

	Page
ABSTRACT.....	v
I. INTRODUCTION.....	1
II. HISTORY OF THE MIXTEC.....	3
III. HISTORY OF CODEX ZOUCHE-NUTTALL.....	8
IV. SIGNIFICANCE OF ETHNOBOTANY IN CODEX ZOUCHE-NUTTALL.....	10
V. LIMITATIONS.....	17
VI. STYLISTIC VARIATION OR ACTUAL VARIATION.....	26
VII. FUTURE OF ETHNOBOTANY IN CODEX ZOUCHE-NUTTALL.....	33
WORKS CITED.....	36

ABSTRACT

There is a gap in the literature of the ethnobotany of the Mixtec people of Oaxaca, Mexico; without this knowledge, a big aspect of the culture of the ancient Mixtec people is missing. The Mixtec civilization left behind codices that are drawings that can be considered an open form of writing. The codices are a systematic set of depictions that is read from right to left, and it details history through biographies, genealogies, religious and political events of the Mixtec people. This thesis examines the significance of the botanical iconography in Codex Zouche-Nuttall. It is important because it is a Pre-Columbian document that is void of any Spanish influence, so all the depictions of flora must be the plants the Mixtec civilization used in their daily lives before the conquest. The purpose of this thesis is to present extensive research into the current literature of ethnobotany in the Oaxaca region, analyze the contents of the Codex Zouche-Nuttall, try to uncover any reason that may be preventing the progress of the topic, and to determine what needs to be done to learn the ethnobotanical use of plants to the Mixtec People. There is currently a major roadblock that might prevent conducting any type of anthropological or archeological research in Oaxaca. The violence due to drug cartels in Mexico jeopardizes the safety of any type of researcher, especially in the mountainsides of Oaxaca where cartels retreat to hide out. There is too much liability at the moment to safely conduct any research projects in the area. This thesis lays out the foundation of bridging the gap in the knowledge of ethnobotany to the Mixtec people of Oaxaca. It also serves as a beginning point in the work of species identification and the ethnobotanical uses of the hundreds of plants depicted in Codex Zouche-Nuttall.

INTRODUCTION

The Mixtec Codex Zouche-Nuttall contains hundreds of depictions of botanical iconography throughout the 84 page fan-fold document. Fascinated by these images, I wanted to know what species of plants they were and also I wanted to know what they were used for in the everyday life of the ancient Mixtec people. I researched these question from books, the internet, and from conversations with various professors, but to my disappointment none of these resources could provide the answers I was looking for. Instead of being discouraged, this motivated me to pursue this topic further until I can ascertain the answers to these questions. Ethnobotanical research will require a combination of historical, ethnographical, ethnobotanical research as well as information obtained from archeological and paleoethnobotanical analysis of both macrobotanical and microbotanical remains. Until that work that can be completed, it is necessary to understand the importance of the relationship that plants and culture share. Due to a gap of literature in the ethnobotany of the Mesoamerican Mixtec culture, this thesis is aimed to explaining the significance of being able to identify the ethnobotanical use of the plants represented in the Zouche-Nuttall Codex. Certainly such research will provide a botanical understanding of the culture of the ancient Mixtec people. To be able to bridge this gap of literature, it is necessary to recognize the problems that researchers currently face when attempting to identify all the flora represented in the Zouche-Nuttall Codex. Lastly, after identifying the problems that researchers face, it will be easier to explore what can be done to overcome these obstacles to expand the research of ethnobotany on the Mixtec Culture.

When people think of Pre-Columbian Mesoamerica, the societies that most commonly come to mind are the Mexica (Aztecs), the Mayans, and the mysterious Toltecs. The Aztecs and Mayans were both documented by first-hand accounts of Spanish friars, so it makes sense for them to be known to the modern western literary world. Unfortunately during the Spanish conquest of Mexico, the Conquistadors and the Roman Catholic clergy (missionaries, friars, priests, and bishops) destroyed many native documents, either to take away power from those they were conquering or to dismiss any native religious ideals so it would be easier to impose the teachings of Catholicism on the native people of Mesoamerica. For example, Fray Diego de Landa, the Bishop of Yucatán, in 1562 burned at least twenty-seven Mayan books because he determined they must be works of the devil (Baldwin 1998:120). The Spanish are not the only ones responsible for destroying many indigenous documents, because the Mexica have been reported to practice book burning in the Valley of Mexico, even before Spanish made contact with the New World. After the Mexica victory over Azcapotzalco, Lord Itzcoatl, Tlacaélel, and other Aztec leaders burned their own history books alongside with the books from Azcapotzalco, in order to rewrite their own history. The Mexica now claimed that they descended from Toltec nobility, and they also positioned their cosmology with Huitzilopochtli. Huitzilopochtli, the God of War, status was raised to that of the creator gods of old times (Portilla 1980:25). Both the Spanish and Mexica seemed to have burned books for similar reasons. This burning of primary documents has led to neglect of the study of other societies in Pre-Columbian Mesoamerica by contemporary scholars, due to the lack of primary evidence. Fortunately, for the Mixtec people of Oaxaca, five of Pre-Columbian codices have survived, Codex Vindobonensis Mexicanus I, Codex

Zouche-Nuttall, Codex Selden, Codex Bodley, and Codex Alfonso Caso (Williams 2009:51). The Ancient Mixtec civilization was one of the remaining powerful civilizations of Mexico during the time of the Mexica expansion into the Central Valleys of Mexico. The Oaxaca valley was once dominated by the Zapotec civilization but the Mixtec were able to replace them as the dominant power in Oaxaca.

HISTORY OF THE MIXTEC PEOPLE

The Mixtec are a group of indigenous Mesoamerican people that occupied the current Mexican states of Oaxaca, Guerrero, and Puebla. Historically this region of Mexico occupied by the Mixtec was known as the La Mixteca. The La Mixteca was further divided into the Mixteca Alta, the Mixteca Baja, and the Mixtec de la Costa. The Mixteca Alta is located in the high, cold, fertile valleys of Oaxaca and is surrounded by mountains. This region borders the Zapotec civilization of southern and eastern Oaxaca. For most of Mixtec history the Mixteca Alta was the dominant political force within this geographical region. The capitals of the Mixtec nation located in the central highlands, in order to prevent Zapotec expansion into the Mixtec Empire. To the north and west lies the Mixteca Baja, which is centered in the lowlands of western and northwestern Oaxaca. Lastly, The Mixteca de la Costa was located on the southern lowlands of Oaxaca and along the pacific coastal lowlands. The Mixteca de la Costa become a center hub for the Mixtec Empire after the great Mixtec Warrior Lord, Eight Deer Jaguar Claw, established power in Tututepec, a site close to the coast (Weaver 1972:417). Tututepec was an important bureaucratic state to the Mixtec civilization whose reputation was created in the 11th century under leadership of Eight Deer Jaguar Claw, and continued until Spanish arrival. Eight Deer Jaguar Claw gained the title *tecuhlti* through an alliance with the

Tolteca-Chichimeca. Through this alliance he legitimized his claim to ruler-ship of his hometown, Tilantongo, in the Mixteca Alta and the city of Tututepec in the Mixteca Costa even though he did not have any genealogical ties to the ruling families of these cities (Joyce 2010:260). Eight Deer Jaguar Claw was a warlord that ended up conquering all the rival Mixtec sites in the La Mixteca. He was the only Mixtec ruler to have united the Mexica Alta and the Mexica Baja into a single state (Weaver 1972:418). According to the codices, there is a tree-birth event at Apoala that produces the nobles that end up founding important cities that established the Mixtec Empire in the Oaxaca region.

The tree born nobles from the Valley of Apoala, founded important political centers for the Mixtec Empire such as Tilantongo, Achiutla, Jaltepec, and Yucuñudahui. (Joyce 2010:259) The codices themselves focus on the four ruling houses at Tilantongo, Teozaulco, Achiutla, and Tlaxiaco (Joyce 2010:269), except for Codex Selden which focuses on Lady Six Monkey of Jaltepec. The Mixtec also inhabited the ancient city of Monte Albán which was originally a Zapotec city for up to ten centuries before the Mixtec gained control of it during the 14th century. This shift in inhabitation is clearly seen in the archeological record in the differences of pottery and tombs between Monte Alban phase IV and Monte Alban Phase V (Paddock 1966:238). Even though the Mixtec and Zapotec empires were in close proximity of one another, there is a clear difference in their artistic styles and architecture.

The earliest inhabitation of the mountains and valleys of Oaxaca were hunters and gatherers who entered from the north around 9000BCE. Between the years 9000BCE to 2000 BCE, there is evidence that agriculture began to develop in the region. The cultivation of land led the early societies of Oaxaca to develop permanent villages instead

of being nomadic. Soon enough the interaction of these permanent villages resulted in a state level society with an elite who exercised political and religious power (Talbott 2015). As the society became more complex, the people made advances in writing, numbering, architecture, and artistry. By the end of the seventh century of the Common Era, the Mixtec civilization was able to replace the Zapotec civilization as the dominant power in Oaxaca. The Mixtec people extended their influence to other areas of Mexico until the Mexica took control of the land and forced the inhabitants of Oaxaca to pay tribute to their kingdom (Talbott 2015). Even though the Ancient Mixtec Civilization had to pay tribute to the Mexica empire, they resisted their control and never was fully conquered by the Mexica.

The Mixtec civilization suffered the same fate as the rest of the indigenous peoples of Mexico; they were ultimately conquered by Spanish conquistadors with the help of Lord Lachi, the Zapotec ruler of Tehuantepec in the 16th century. The Zapotec site of Tehuantepec was traditionally an enemy to the Mixtec site of Tututepec. Tututepec held a population of about 250,000 people. After Lord Lachi told Cortés of this rich and powerful city, the Spanish sent the conquistador, Pedro de Alvarado, to the Mixteca de la Costa in 1522 with about 200 Spanish soldiers and an army of thousands of Zapotec soldiers. After the conquest, diseases such as smallpox and measles ravaged the indigenous people, and the population of Tututepec dwindled from 250,000 people to 4,500 people in just twenty-two years (Joyce 2010:2-3). Their civilization did not completely die out since there is a fairly large population of Mixtec people living throughout Mexico and in the United States today. Due to the poor economic conditions of Oaxaca, the modern Mixtec people have migrated to various parts of both Mexico and

the United States in search of paying jobs. Another reason for migration out of the Oaxaca, is an ongoing struggle for indigenous rights, and the treatment of the Mixtec as second class citizens in Mexico. As of 2011, an estimated 150,000 Mixtec people were living in California, and 25,000 to 30,000 in New York City (Torrens 2011). The Mixtec communities are one of the remaining few that still have cultural autonomy. Cultural autonomy is becoming increasingly difficult in this age due to technology that creates an assimilated culture.

The term Mixtec is derived from the Nahuatl word *mixtecah*, which translates into English as the term "cloud people" (Ávila 2010:1). Since the Spanish made contact with the Mexica before the Mixtecs, it is logical that these people continue to be called Mixtec into modern times. One of the names the Mixtec people have called themselves is ñuu savi, which translates as 'pueblos de la lluvia' in Spanish or as 'people of the rain' in English (Barabas & Bartolomé 1999:146). The Mixtec in Pre-Columbian times were probably best known for the craftsmanship of the Mixtec artisans who produced work in stone, animal hide, wood, turquoise, bone, and metals such as gold and silver. The Mixtec artisans were even viewed as the most skilled goldsmiths in all of ancient Mesoamerica, and were highly regarded for their exceptional mastery of jewelry. Products by Mixtec goldsmiths formed an important part of the tribute they paid to the Mexica after the Mexica expansion in the valley of Mexico, and in some cases some Mixtec artisans even worked in Mexica workshops to produce artifacts for their rulers and ceremonies (Ruvalcaba-Sil 2009:291-292).

The Mixtec are well known in the anthropological world for their detailed codices, which was compromised of phonetic pictures that encode their history through

biographies, genealogies, religious and political events, and the founding of royal dynasties in a fan-fold book made out of deer skin (Williams 2013:21). The best known story out of the Mixtec Codices is that of warrior Lord Eight Deer Jaguar Claw, named after the day in which he was born, whose personal name is Jaguar Claw. His epic history documents his conquest over the Mixtec Empire and this story is depicted in several codices, including Codex Bodley and Codex Zouche-Nuttall. He successfully conquered and united most of the Mixteca region for the first and last time in Mixtec history. As previously stated, there are a total of five Pre-Columbian Mixtec Codices that have survived into the present that have been discovered: Codex Seldon, Bodley, Zouche-Nuttall, Vindobonensis Mexicanus I, and Codex Alfonso Caso. Codex Zouche-Nuttall contains two different manuscripts, the reverse side which appears to have been written first, and the obverse side which is a more recent document. Codex Vindobonensis Mexican I also contains two different manuscripts but the obverse side is older while the reverse side is the more recent manuscript on the codex. There is total of seven documents that are found throughout the five different codices (Williams 2013:xii). The codices are written in open writing system they are not bound to a specific language or alphabet system, but the images are arranged in a systematic manner than can be interpreted by the reader, regardless of the language they speak. More specifically "...the Mixtec histories chiefly employ iconic symbols. Therefore, they are linguistically unavailable but symbolically assessable and available for study because they literally still tell their stories. The manuscript writings are stated in icons, symbols like language but sans phonemes and grammar. They are provocateurs of image, religious and environmental symbols imbued with meaning that can communicate across cultures

separated by time” (Williams 2013:xiv). The people depicted in the codices are conveniently named after the day and sign they were born under; to determine what day it is, their calendar system is described to be a combination of a coefficient numbered 1-13, and one of the 20 day signs; Alligator, Wind, House, Lizard, Snake, Death, Deer, Rabbit, Water, Dog, Monkey, Grass, Reed, Jaguar, Eagle, Vulture, Motion, Flint, Rain, and Flower. There are 260 days in their sacred calendrical year, and a set 20 trecenas, which are the 13 day cycles, within that year. The 260-day sacred calendar takes seventy-three years until the calendar resets and begins back at 1 alligator which is equivalent to fifty-two years in the 365 day solar calendar (Williams 2013:234).

HISTORY OF CODEX ZOUCHE-NUTTALL

The Codex Zouche Nuttall is an accordion-folded pre-Columbian document of Mixtec pictography, it is currently part of the collections of the British Museum. It is one of about sixteen documents from Mesoamerica that is completely produced prior to contact with the Spanish. The Codex is in excellent shape with a lot of colors still preserved. It is also one of three Mixtec codices that recorded the genealogies, alliances and conquests of the 11th and 12th century rulers of highland Oaxaca. The contents of Zouche-Nuttall highlights the Tilantongo kingdom under the leadership of Lord Eight Deer Jaguar Claw. The codex derives its name from the Baron Zouche, its donor, and Zelia Nuttall, who first published it in 1902. The Codex Zouche-Nuttall, has been dated back to the 14th century and is composed of sixteen strips of animal hide leather with the dimensions of 18.4 cm by 23.3-25.05 cm, since some pages vary in length. The codex folds together like a screen and is vividly painted on both sides since the animal hide was covered in gesso (white primer) (Williams 2013:19). Codex Zouche Nuttall actually

contains two different documents, the obverse side of the codex is complete and appears to be the more recent of the two sides, while the reverse side of the document which appears to be written first is incomplete. The reserve side of the document is believed to be incomplete because it has pages that have yet to be finished being colored in.

In Cortes' manifest of 1519, he mentions two 'native books' that were found in Montezuma II's library; those two books are now believed to be Codex Vindobonensis Mexicanus I and Codex Zouche-Nuttall (Williams 2013:11). It is unclear exactly how the documents came into the Mexica's possession, since when Cortes finds the documents, he is unaware that these particular codices are Mixtec in origin. There is no primary evidence of when the codices reached Spain but current theories estimate it to be sometime during the 16th century. After the Codices' arrival in Spain, the documents took very different paths in its history throughout Europe since no one possessed both codices. Codex Zouche-Nuttall disappeared from history for a couple of hundreds of years until it was first identified at the Monastery of San Marco in Florence, Italy, in 1854. Years after its rediscovery the document was then sold in 1859 to John Temple Leader who had sent it to his friend Sir Robert Curzon, the 14th Baron Zouche. The manuscript was loaned to the British Museum in 1876 a couple of years after 14th Baron Zouche's death. Zelia Nuttall, an American archeologist, hired two British artists to make a facsimile, an exact replica, of the accordion fanfold document. Zelia Nuttall wrote the introduction to the facsimile and arranged for the publication of the document by the Peabody Museum of Archaeology and Ethnology, at Harvard in 1902 (Williams 2013:10). "She incorrectly thought the document was Aztec and her eulogists thought the document was Zapotec. She did correctly link the Codex with Codex Vienna and that

both documents were the “native Books” in Montezuma’s Library, mentioned in Cortes’ manifest of 1519” (Williams 2013:11). According to the British Museums website, the sister of the Sir Robert Curzon inherited all of his books and manuscripts after the 14th Baron’s death. She then donated the Codex to the British Museum in 1917 and it has been in their collection ever since. In 1944, Alfonso Caso attended a history conference in Guadalajara, Mexico and realized that a map labeled as Teozacoalco, Jalisco was actually a missing 16th century map of Teozacoalco, Oaxaca from the Relaciones Geograficas collection. Alfonso Caso was able to identify the kings and queens in the map of Teozacoalco, Oaxaca (Williams 2013:17). He concluded based off his research that the Codex Manuscripts, Selden, Bodley, Zouche-Nuttall, Vindobonensis Mexicanus I, and Colombino, all have mention of those rulers, so he was the first to correctly identify that the authors of the codex manuscripts could not be Mexica or Zapotec, but must be Mixtec in origin.

SIGNIFICANCE OF ETHNOBOTANY IN CODEX ZOUCHE-NUTTALL

Ethnobotany is one of the lesser known disciplines in the field of anthropology but it is an essential part of attaining a holistic view of a culture. Vegetation encompasses every continent except for Antarctica, so ethnobotany aims to document, describe, and explain complex relationships between cultures and the plants in their environment. The field of ethnobotany focuses predominantly on people’s use of plants, the management of the vegetative resources, and how plants are perceived across human cultures. Humans have depended on vegetation throughout all of recorded history for food, medicine, tools, weapons construction material, for clothing and textiles. There is a lot of commonly known plants in modern day society that have a multitude of useful purposes, but the

problem is that the majority of those commonly known plants are probably not native to the environments they are found in. An ecosystem is a very integrated network that is fragile in the sense that it requires maintaining a certain balance to be able to thrive and survive. For the past 500 years societies have introduced and spread non-native species of plants across the globe, and it has disrupted the natural order of nature. Ethnobotany aims to gather cultural knowledge of plants especially within indigenous societies because this knowledge has usually been passed down for generations. This knowledge often times encompasses mainly native plants in a specific region because their ancestors have been rooted in the same environment for centuries. Our society depends on plants now, just as much as ever, but unfortunately the environment has become a secondary concern in the post-industrial world that we live in. Human population is currently greater now than at any point in recorded history, consequently the impact we are having on our planet must be directly proportional to the population increase. Human activity has always had an effect on the natural environment, but the rate of environmental degradation has noticeably increased in the modern era. Environmental degradation and desertification is caused by human agricultural activity, deforestation, pollution into the environment, overfishing/hunting, pesticides, herbicides, introduction of non-native species, and resource extraction, to name a few. Knowledge of plants and their uses used to be common knowledge in society, but today much of that knowledge has been lost since it was not passed down to the current generations. Urbanization has created a detachment between humans and their environment. Although our ancestors were able to live sustainably off the environment for thousands of years without any of our modern technology, the knowledge that was once an integral part of our society has become

esoteric knowledge. Esoteric knowledge is something that is only understood or intended to be known by a small group of people that have a specialized knowledge into the subject. Due to this detachment between modern society and the environment, people are generally unaware of subtle changes of nature and would probably be unable to live sustainably off the natural environment. Plants had a central role in the culture and the cosmologies of the Ancient Mixtec people, because in Codex Zouche-Nuttall there are hundreds of depictions of botanical iconography on both the obverse side and the reverse side of the document.

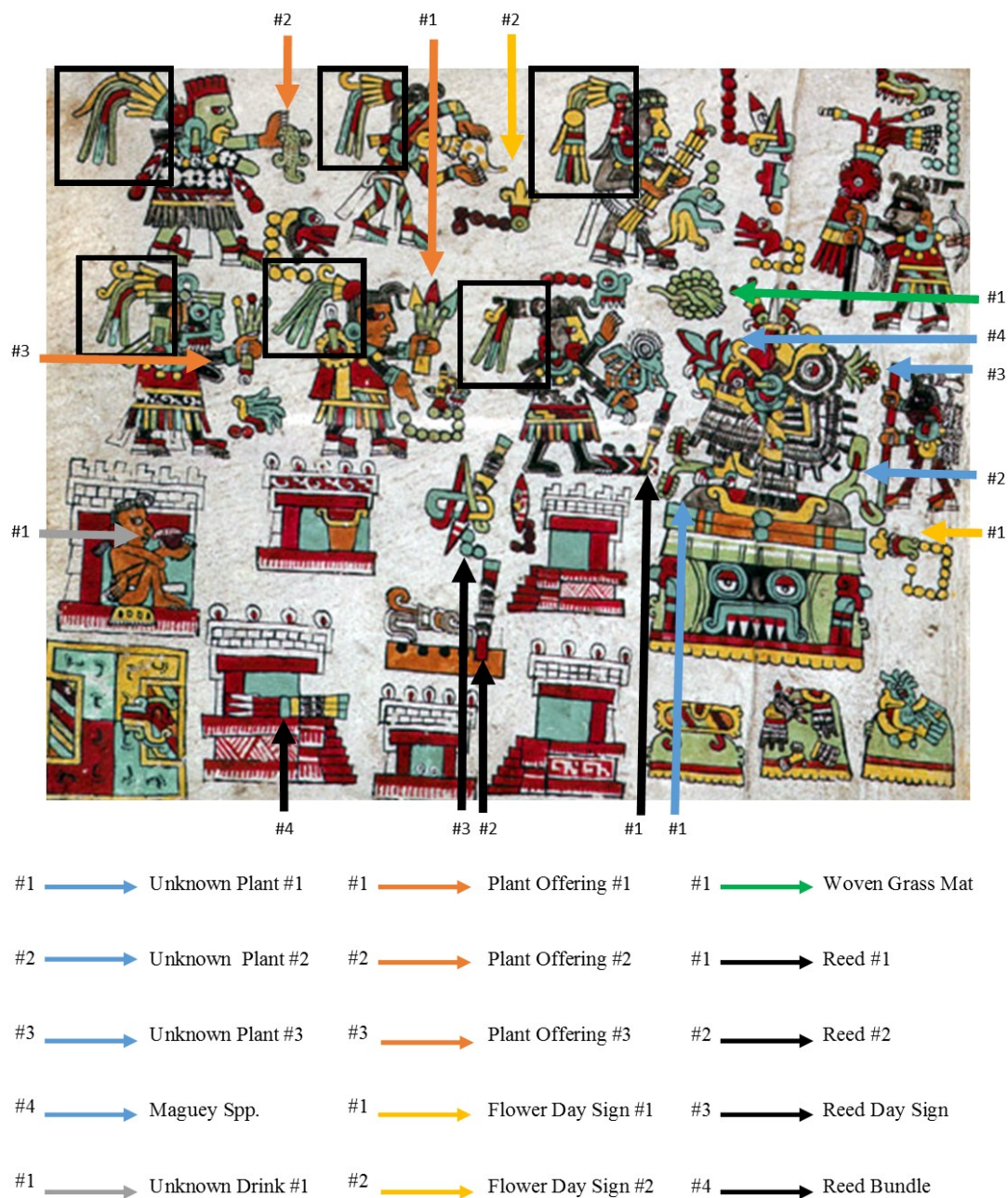
Within the contents of Codex Zouche-Nuttall, there are botanical depictions of various grasses, reeds, succulents, vines, flowers, and trees throughout the vividly detailed drawn manuscript. The floral iconography is encountered on almost every page of the Codex, while some of the depictions appear to have stylized variation, others may be trying to indicate a different species of plant within the same genus. The plants depicted are being used for a variety of reasons such as textiles, regalia, decorative accessories, weapons, woven mats for ceremonial use and sacrifice, ethnogenic uses of plants in rituals and ceremonies, offerings to the Gods and rulers, as day signs, as name signs, as well as to indicate the names of specific sites and locations. These usages of plants in Codex Zouche-Nuttall is not even mentioning the cosmological aspects that the role of plants have played in the lives of the Ancient Mixtec people, because concepts that abstract cannot just be deciphered based off of a couple surviving documents. Some of the characters in the Codex Zouche-Nuttall have genealogical ties being associated with plants. The tree born nobles, mentioned earlier, that founded important political centers for the Mixtec Empire are linked in their mythology to an important tree-birthing

ceremony by the river in Apoala which is documented in page 35a of Codex Vindobonensis Mexicanus I (Williams 2009:66). Looking at the codex itself does not explain what the significance of being tree born or other metaphorical questions that may arise, but primary ethnographic evidence is necessary to understand the cosmological importance of plants and the role they play in the mythologies of the Ancient Mixtec People.

The ancestors of the Mixtec civilization as well as the Zapotec civilization were known as the Cloud People, which were the first known inhabitants of La Mixteca (Flannery and Marcus 1983:11). Little is known of the cloud people, but this ancient society probably introduced agriculture to the region, which had a profound effect on the cultural development of the Mixteca (Talbot 2015). Agriculture has been fundamental to the people of Oaxaca for thousands of years. The Ancient Mixtec people's diet consisted of maize, beans, squash, avocados, and chili peppers, they even built storage systems to preserve these crops (Licón 2001:147). The staple crops of Mexico such as maize, beans, and squash were brought to the Mixteca as cultivated plants probably between the middle to the end of the Preceramic period. Important crops such as chilies and gourds were domesticated in Oaxaca while other important crops to the Mixtec like maguey, avocados trees, guajes (native legumes), and even psychedelic mushrooms grew wild in this region (Talbot 2015). In Oaxaca, the society used a combination of growing domesticated crops and foraging for wild species in their fertile valleys to sustain their society.

A good example to see the multiple ways that the botanical representations may be encountered while reading through the codex, is by applying structural analysis on page two of Codex Zouche-Nuttall. Just this page alone depicts iconography of woven

grass mats, portraying the various states of how reed is represented, bundles of sacred plants, plants growing out of Yucuñudahui (Rain God Hill), and the page even shows Lord Eight Wind Eagle Flints as the source of vegetation since there are plants growing out of his body (Hamann 2012:29).



□ Hair grass decoration (5 Depictions)

Figure 1: Codex Zouche-Nuttall (obverse), page 2. © The Trustees of the British Museum.

Figure 1 shows up to twenty depictions of plants being used in a multitude of ways. There are five depictions of grass decorations attached to hair of people, four depictions of reeds, four depictions of vegetation, there are three depictions of plants in bundles or as offerings, there are two different depictions of flowers as day signs, there is a depiction of a woven grass mat, and a unidentified drink. None of these plants have been identified except for the Maguey, but that is not even an accurate identification because the term maguey does not refer to a specific species but rather it is a general term for the century plant or agave (Williams 2013:38). The plant behind Lord Eight Wind Eagle Flint's feet has been hypothesized to be a tobacco since it appears to be a stalk with paddle-shaped leaves, but that is just speculation that has not yet been confirmed (Williams 2013:38). The reeds are depicted in a variety of ways, such as a day glyph, as a weapon, in a bundle of reeds, and to signify a place that has been conquered. Round woven grass mats and grass knots are associated with bird decapitation ceremonies. The way that grass mats are woven may be made to resemble an even more ancient vegetation prototype such as a horizontal section through an ear of corn (Williams 2013:39). The unidentified drink may either be pulque, a fermented beverage made out of agave, or a drink made of cacao, which is a common drink during ritual in Mesoamerica. Overall Page 2 of Codex Zouche-Nuttall is depicting one of the nine ordering rituals that sanctified the Mixtec landscape. The important aspect of this ritual was the,

....raising of a bundle of powerful sacred plants above or before the area to be sanctified or "ordered". These plants were originally acquired after the

Vindobonensis Mexicanus I sacred mushroom ceremony (page 24b) when Lord Seven Two Faces descends beneath the lineage river at Apoala and retrieves them from the underworld (Williams 2013:38).

Trying to identify all the botanical iconography depicted in Codex Zouche-Nuttall is a difficult task because Mexico is one of the most ecologically diverse countries in the world. Mexico is a member of the Conservation International's list of megadiverse countries, which is composed of seventeen nations that harbors of the majority of known biological species. Mexico ranks fourth in the world in overall species diversity, due to the amount of variety of endemic mammals, reptiles, and plants that are found in the country. (Martin et al. 2011:253). Within this biologically rich country, the Mixtec people lived in the most diverse region of them all, since Oaxaca is considered to be the most biologically and culturally diverse state in Mexico. The state of Oaxaca is known for their extensive forests that consists of sixty-four percent of the state's 9.5 million hectares" (Martin et al. 2011:252). Understanding the ethnobotany of a culture goes much deeper than just being able to scientifically identify a plant, because it searches for significance that can only be understood in terms of human nature and not a scientific lens. Ethnobotany needs primary research to understand exactly how the plants were processed and used. There is a possibility that the ancient knowledge of the plants depicted in the codex may have been forgotten but learning about the modern communities' usage of these plants may give us a better idea of how they may have once been used in the past. If some of the plant species depicted have gone extinct then research needs to be done if closely related species of plants can be used in a similar way.

LIMITATIONS

Attempting to progress the subject of ethnobotany of the ancient Mixtec culture, one must consider all the possible limitations in conducting this type of research in the state of Oaxaca. There is widespread environmental degradation throughout the Oaxaca Valley and the surrounding mountainsides. The cattle that the Spanish settlers introduced into this region have now been grazing for almost five hundred years. The combination of European domesticated cattle such as goats, cows, sheep, horses, and pigs have caused a negative impact on the environment because they require a large amount of grazing to feed the animals. As a result of human activity, the once fertile lands have been transformed to be used mainly for agriculture purposes; this practice displaces the native plants in the region and contributes to deforestation and desertification. Desertification is a certain type of environmental degradation, when the environment becomes more arid while losing bodies of water, vegetation, and wildlife. The abundance of vegetation that once grew in the Oaxaca region has been gradually diminishing, because of the increased rate of environmental degradation. As a result of the destructive practices in recent history, some of the botanical glyphs depicted in Codex Zouche-Nuttall may be vegetative species that may have gone extinct by now, which will make it more difficult to confirm what the botanical glyph can be.

The Mexican Economy naturally wants to grow crops that are popular to trade and sell on the global market, so many of the farms in the region are forced to grow cash crops to be able to make a living of the market instead of growing sustainable native crops. Unfortunately, this is not just a local problem but a global problem as because despite the abundance of crop diversity on this planet, the world's current food base has

been reduced to a dangerously low level of diversity of crops. Just a small handful of crops provide the vast majority of humanity's food globally such as maize, wheat, rice, potatoes, cassava, soybeans, sweet potatoes, sorghum, yams, and plantain (Minnis 2014:3). A reduction of any resource in this balanced ecosystem is risky for long term sustainability, and considerable efforts are being expanded to collect and preserve the native and lesser known crops of the world that has sustained cultures globally for thousands of years.

The environmental degradation cannot just be solely blamed just on the Spanish introduction of cattle and modern agricultural practices, because the environment in the Oaxaca has been responding to the agricultural practices of the ancient societies that once inhabited these valleys. Specifically during the Middle Formative period (1800 BCE–200CE) there was a heavy pressure on the vegetation due to the Swidden farming practices. Swidden farming is when an area of land is cleared for cultivation by slashing and burning the vegetation. These practices put pressure on vegetation to replenish and that pressure is sustained from the Middle Formative period to modern era. There is archeological evidence that there appears to have been minor regional forest recovery during the Classic Period (250CE– 800BCE) or perhaps even more recently during the Early Post-Classic period (800CE– 1100CE). The paleoethnobotanical micro-remains such as pollen and charred microfossils reveals evidence that maize drops out of the archeological record at the end of the Post-Classic. The reduction of maize is probably a result of the demographic collapse and major land use changes resulting from the Spanish Conquest (Joyce 2013:54-56). The environment has had dramatic changes from human

activity, so when conducting research one must take into account that the living biological record may differ from the paleoethnobotanical record.

Invasive species, which are plants that are non-native to the environment, have also been a contributor to environmental degradation. Non-native species do not have any natural predators so these plants just expand while diminishing the diversity of native floral in an environment. If native plants are being displaced, then some of the plants in the floral depictions in the Mixtec codex may not inhabit the La Mixteca anymore. In Oaxaca they are experiencing an invasion of Bracken fern, *Pteridium aquilinum*, which is a non-native plant that has particularly been shown to be responsible for some of the degradation in the environment. An example of this bracken fern invasion are from two communities in the Chinantla region, Santiago Tlatepusco and San Pedro Tlatepusco. The farmers in this area have been forced to find new agricultural areas in forests far from their settlements because the bracken fern infestation has ruined the pre-existing agricultural plots they once used. If *Pteridium aquilinum* continues expanding into current agricultural areas then it could put substantial pressure on the ecosystem that will limit future forests from being able to replenish themselves (Berget, Duran & Bray 2015:548). Some of the main cash crops in the Oaxaca region are yucca and pineapple. Local farmers like to grow Yucca and Pineapple because they can thrive in well in degraded areas. Unfortunately, these crops requires constant clearing and maintenance after the harvest or else the Bracken Fern overcomes the plots quickly. Preventing a bracken fern invasion is labor intensive work, so farmers will often clear forests to create new plots for their fields. This may seem like it will be harder to task to do after ever harvest but according to the farmers from Santiago Tlatepusco and San Pedro Tlatepusco,

eliminating the bracken ridge from existing agricultural areas requires approximately four times the amount of labor than it is to clear a new plot in the forest because they need to cut and pull the roots by hand which is time consuming and labor intensive. Also there are potential hazardous such as venomous snakes hide in the high density fern and the plant has high combustible properties that can fuel wildfires (Berget, Duran & Bray 2015:552). Clearing out new plots of land is greatly contributing to the rate of deforestation and desertification that is occurring in Oaxaca. This plant has many detrimental effects to the natural environment, the biological diversity of the region and creates problems to the local community. The increase of invasive species is an important factor, that often gets overlooked, that contributes to the environmental degradation problem.

The La Mixteca must have look dramatically different in the times of the Ancient Mixtec people because even within the past generation, the landscape has changed dramatically. The following images in figure 2 are photographs from various parts of the Oaxaca region that shows the progression and evidence of environmental degradation:

Evidence of Environmental Degradation in Oaxaca Mexico



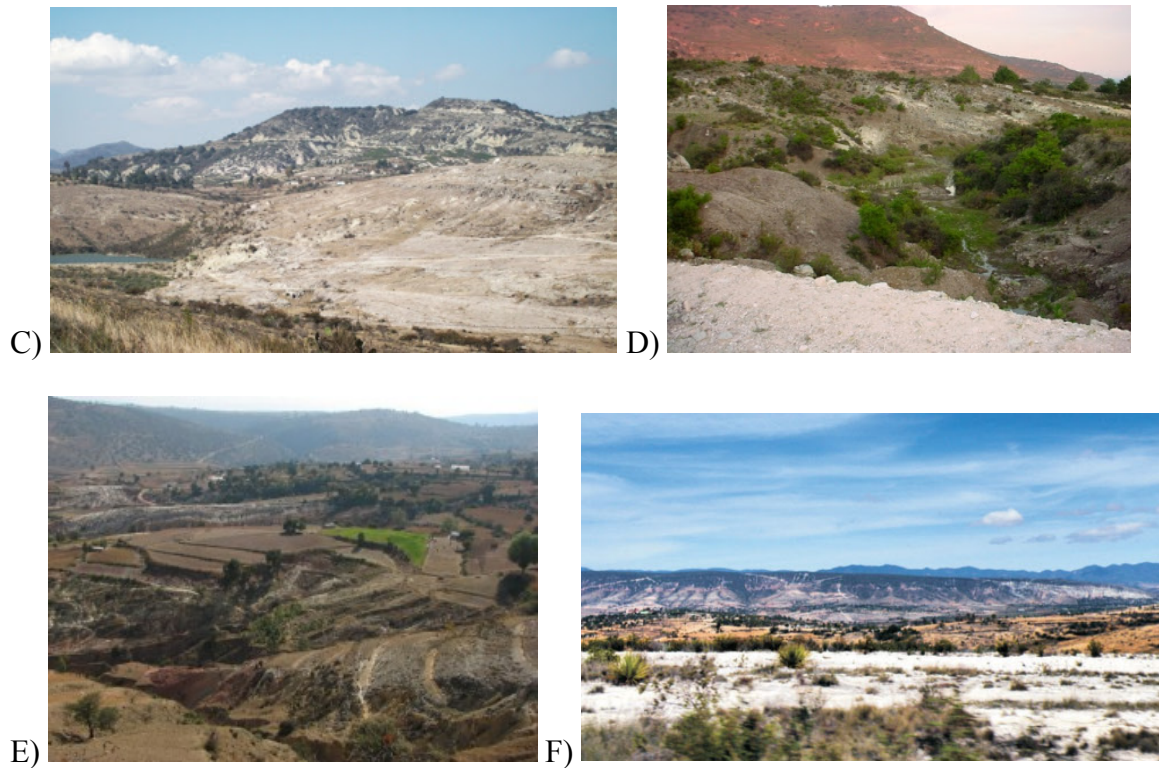


Figure 2: A) Sierra Juarez, Oaxaca; Prsjl; wikimedia.org B) Desertification in La Mixteca; Shinji_Harper; ciudadania-express.com C) Soil Erosion in the Mixteca Alta; Yaredi Garcia; cuexcomate.com D) More Soil Erosion in the Mixteca Alta Y; Yaredi Garcia; cuexcomate.com E) Ground loss in La Mixteca, Oaxaca; Shinji_Harper; ciudadania-express.com F) Mixtec Highland; David Nuñez & Gerry Marten; ecotippingpoints.org

The images in figure 2 depicts the progression of how wide spread environmental degradation has become in the state of Oaxaca. Deforestation and erosion makes the La Mixteca Alta Highland look like a desert. All these images are frightening because it depicts the destructive impact humans have had on the environment. The first image, figure 2.A, shows the least amount of environmental degradation but if the viewer looks closely to the mountainsides, they will notice gaps in the forest that have been cleared for human activity. Once the nutrients in the fertile soil are depleted during agricultural uses then the land begins undergoing the process of desertification as seen in figures 2.B and

2.F. Once the land becomes more desert like, the ground cannot hold back erosion because there is less vegetation to support a strong foundation. Figures 2.C, 2.D, and 2.E each depict noticeable ground loss due to soil erosion. Soil erosion causes the nutrient rich topsoil to weather away, which can be detrimental to the agricultural communities living here. Instead of trying to replenish the environment that has been damaged, the farmers continue to find new plots to create to compensate of losing their previous agricultural areas to environmental degradation. This practice is destructive because eventually the environment will reach a tipping point, and nature will not be able to replenish itself, since all the nutrients have been exhausted.

Another major limitation in pursuing research further is the current war on drugs and the rise of the cartels in Mexico. Currently as a result of the cartels inhabiting the Mountainsides of La Mixteca, the Oaxaca valley and the surrounding mountainsides have been prone to extreme violence in the past decade. Conducting ethnographic and archeological work just is not feasible at the moment due to the safety risk associated with the area. This region has fallen under control of the various cartel criminal organizations, due to systemic socio-economic pressure which has created an inequality of wealth for the citizens of Mexico. According to a journalism article by the Associated Press, the farmers from villages in the Sierra Madre del Sur Mountain, range and their families are facing serious economic hardships. In an agricultural society when there are little agricultural jobs due to monopolies creating mega-farms, the farmers sometimes have no choice but to convert land for the cartels to be able to support their families. Another issue these farmers face when trying to acquire agricultural jobs, is that the environment is not as fertile as it once was. As a result, in the need for income, the cartels

capitalized on the problem and force farmers to grow marijuana and opium poppies instead of their regular crops. The people living in these mountain ranges just cannot say no because if the farmers refuse to produce those crops for the cartels, then they will stay in poverty which runs the risk that their families die from starvation, inadequate health care, or even face punishment such as death from refusing a demand from the cartel organizations. According to Humberto Nava Reyna, the head of the Supreme Council of the Towns of the Filo Mayor, a group that promotes development projects in the mountains "Almost everyone thinks the people in these mountains are bad people, and that's not true....They can't stop planting poppies as long as there is demand, and the government doesn't provide any help" (Stevenson 2015). Using existing plots of land is not feasible because then it will be visible to the police so the farmers are required to clear new plots usually in the mountainsides so the poppy fields can grow while being concealed by towering pines and fir trees. Creating new plots of fields in the mountainside is causing deforestation, but here is a catch 22 because some of the mountain villages that protect their forests from illegal logging activity, are also doing it to hide the fields that cartel organizations use (Stevenson 2015). Both the activities from illegal logging, and cultivating plots of opium and marijuana are contributing to environmental degradation in the region. This environmental degradation and deforestation reduces the amount of botanical diversity that naturally occurs, and the fields of opium and marijuana also run the risk of getting herbicide sprayed on the fields by the government, which will contribute to the increased rate of environmental decline.

The government uses aerial herbicide spraying on the drug fields without the consent of the villagers, often times not even notifying them what herbicide is. The

herbicides sprays have been reported to kill both the poppies and any other vegetation around them. When the local Ocote pine trees get killed or damaged by the herbicide spraying, it allows invasive beetles to attack the weakened trees, and then spread to neighboring trees which causes negative effects in the ecosystem. The head of the Supreme Council of the Town of the Filo Mayor believes that "The money the government spends on aerial spraying would better be spent on long-term development projects," (Stevenson 2015). Not all farmers are succumbing to the influence of the cartels because in two of the three self-admitted opium growing villages the AP visited, residents have tried planting avocados, a crop that can bring cash income at similar altitudes in the neighboring state of Michoacan, instead of relying on growing for drug distributors. Another tactic the farmers have tried to combat poor economic conditions, is to build trout ponds, but the people say the trout are small because there is a lack of food due to the degradation of the environment, and the avocado trees take at least seven years before they can yield a viable amount of green, shiny fruit that can be used for substance or that can be sold (Stevenson 2015). It would be unethical to disregard the socio-economic conditions that the indigenous people face, just to try extract the esoteric knowledge between the relationships of plants and the Mixtec people.

A problem that indigenous people have with anthropologist is the moral issue of intellectual property rights. Researchers cannot cash out on a discovery if that knowledge had already had belonged to generations of people. There needs to be mutual-benefit sharing because unfortunately a lot of early anthropological work tended to exploit the natives without them receiving proper compensation. Some natives may not want the knowledge to be known to the public, because the tourism industry ravaged many local

Mexican communities after the Mazatec curandera, Maria Sabina, shared knowledge about the sacred mushrooms with Robert Gordon Wasson in the 1950's. These communities got exploited by recreational drug seekers, who did not respect or follow the ritual use of sacred sacraments. Proper ethical procedures need to be carefully followed in order to give the proper credit to the safe keepers of knowledge, while keeping the best interest of the local communities in mind.

Due to the suppression of indigenous rights in the area, intellectual property rights becomes a big factor when conducting ethnobotanical research on the Mixteca. A great deal of information about the traditional uses of plants is still intact with native people, but the native healers are often reluctant to accurately share their knowledge to the outsider world. In *Wind in the Blood: Mayan Healing & Chinese Medicine* the visiting Chinese acupuncturists were able to access levels of Mayan medicine that anthropologists previously were unable to obtain because the acupuncturist had something to share in exchange (Garcia, Sierra, & Balam 1999: 158). Anthropologist cannot expect to receive a wealth of information for free, if they have nothing in return to benefit the healers. As a result of anthropologist taking advantage over the past couple of centuries, there have been many reports of healers and medicine people that would invent nonsense just to satisfy or to mess with the visiting anthropologists. Ethnobotany needs to focus on conservation efforts for plants that are held sacred to the Mixtec community to protect the best interest of the environment, the scientific community, and of course the local community as well.

STYLISTIC VARIATION OR ACTUAL VARIATION

The question that arose when comparing the hundreds of floral glyphs was that, are these differences in the depiction of plants just stylistic variation of the same plant, or are these artists intentionally differentiating that these plants are a different variety of species within the same genus? Although stylized plants in the codices differ somewhat from document to document, at least one of the non-maguey plants in the Zouche-Nuttall appears in Vindobonensis Mexicanus I, namely, a stalk with paddle shaped or spade shaped leaves (Williams 2013:38). This has been hypothesized to be the Tobacco plant in Vindobonensis Mexicanus I but in codex Zouch-Nuttall there appears to a couple different stylizations of that shape, which can indicate different varieties of tobacco, or possibly the artist can be depicted a whole different plant. When comparing the different botanical glyphs together, some of the main factors include color variation, the context of the use of the plant, the variation of the shape of the leaves, flowers, and roots, and also any noticeable stylized differences.

In Mesoamerican literature the calendar system always refers to one of the day signs is as flower and there is has not been an attempt to identify a more specific species of plant. That would be fine if every depiction of the day sign was the same, but in codex Zouche-Nuttall there is a large variation of the day signs in both the obverse and reverse side of the document. The variation in the depictions of flowers in the day sign glyphs, indicate that there naming system may be more complex than originally thought. If the variations of flowers have significant meaning in their 260 sacred day calendar system then we must take that into account and reconsider our current understanding of the calendar system.

Flower Day-Sign Glyphs Obverse





Figure 3: Codex Zouche-Nuttall (obverse) **A)** Two Depictions: Pages 1 & 2 **B)** Four Depictions Pages: 2, 4, 10, 11 **C)** One Depiction: Page 5 **D)** One Depiction: Page 5 **E)** Two Depictions: Pages 6-7 **F)** One Depiction: Page 6 **G)** One Depiction: Page 12 **H)** Two Depictions: Pages 4 & 14 **I)** One Depiction: Page 15 **J)** Four Depictions: Pages 15 & 19b **K)** Twelve Depictions: Pages 16, 17, 19a, 22, 23, 27, 29, 32, 33, 36 **L)** Three Depictions: Pages 11, 16, 23 **M)** One Depiction: Page 16 **N)** Two Depictions: Page 18 & 20 **O)** One Depiction: Page 23 © The Trustees of the British Museum.

In figure 3, there are at least fifteen different varieties of flowers depicted in the day signs and name signs. All the depictions of flowers share the same color scheme, yellow, red, and pale green, some will depict all three colors while other glyphs will only have one or two of these colors. The petal shapes differ greatly but most maintain a basic 3 prong petal shape such as Figures 3.A, 3.B, 3.C, 3.F, 3.H, 3.I, 3.K, 3.L, 3.N, and 3.O. The plants that share the three prong petal shape still have some minimal differences between them such as the spacing between the prongs or the pointiness/curviness of the petal shape. The flowers that do not have a three prong shape tend to differ in shape greatly, Figures 3.E, 3.G, 3.J, 3.M, and one flower is a similar shape as the three pronged flower but it has more petals, Figure 3.D. The most common flower shape was Figure 3.K, there are twelve depictions of that type of botanical glyph in the obverse side of Codex Zouche-Nuttall, associated with various people and Lords. This flower glyph depictions has the three prong shaped but it is laying horizontally, and the roots are twisted together.

Flower Day-Sign Glyphs Reverse

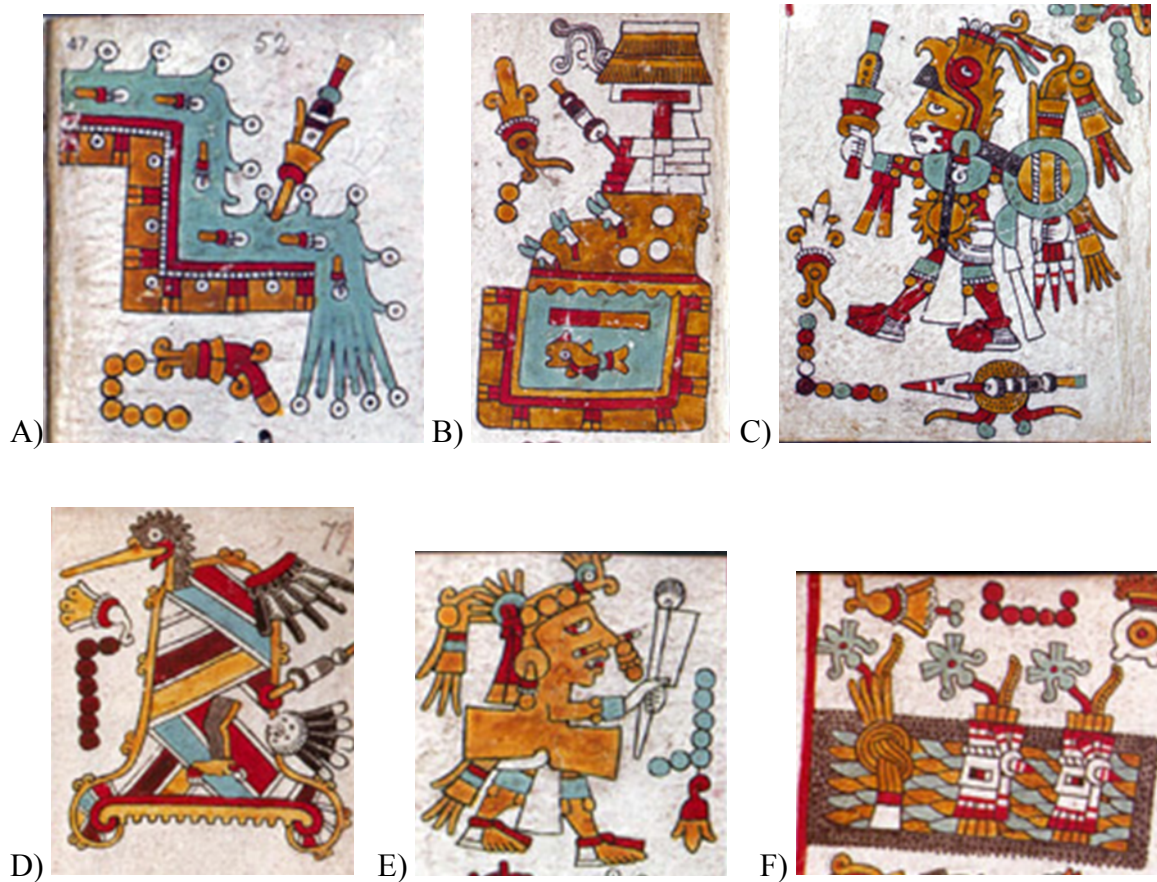


Figure 4: Codex Zouche-Nuttall (reverse) **A)** Eight Depictions: Pages 47, 49, 62, 66, 67, 73, 76a, 76b **B)** Fourteen Depictions: Pages 44, 45, 47, 52, 53, 57, 59, 63, 67-69, 76a-b **C)** Three Depictions: Pages 43, 46, 48 **D)** One Depiction: Page 74 **E)** Two Depictions: Page 76b, **F)** One Depiction: Page 81 © The Trustees of the British Museum.

In the reverse side of the documents, there is less variety of different flower day signs, but the variety is more distinctly pronounced between the flower glyph depictions. The color scheme is different than the obverse side, but this could be due to the reverse side of the document being older. An older document would have had more time for the paint on these codices to have exposure to the environment which will cause the colors to darken in hue. These flower day signs were not grouped by the amount of petals because the basic shape and the color patterning depicted are exactly the same except for the

amount of petals, so it is safe to assume that they are the same genus of flowers but being depicted in different ages in their life cycle. Figures 4.A, 4.B, and 4.C each share the same shape of flower day sign but the color scheme is different. Figure 4.A is primarily red with a secondary golden color, Figure 4.B is uniform in tone and is a golden color, while figure 4.C is primarily white with a secondary golden color. Even though the flowers have different color scheme variation, the roots remain the same and so does the shape of the flower, which can indicate that the artists may be depicting different species of flowers within the same genus. Figures 4.D and 4.F seem to have the basic shape of flower but the color variation and stage of development is different. The flower in Figure 4.F seems to be in the process of growing because of the small leaves extending from the flower head, and the flower in 4.D does not depict this feature. The flower in Figure 4.E seems to resemble to depictions of flower day signs on the obverse side of Codex Zouche-Nuttall since they both portray the three prong flower shape and color scheme, but just the roots have a different style and the flower is pointed down instead of horizontally or upright.

The differences in the day signs is not as simple as deciding between stylistic variation and actual variation because there is combination of both happening in the codex. Some of the differences in plants are stylistic variation because there are different artists on the reverse and the obverse side of Codex Zouche-Nuttall. Some of the differences in day signs are actual variations because some of these flowers have a different shape and color patterning, which will indicate a plant in a different genus altogether. Some of the variation of plants could possibly be the same depiction of flower, but just be depicted in a different stage in its life cycle. The variation in the

depictions of flowers in the day sign glyphs, indicate that their naming system may be more complex than originally thought. If the variations of flowers have significant meaning in their 260 sacred day calendar system then we must take that into account and reconsider our current understanding of the calendar system. The 260 day sacred calendar system may need to be revised and expanded to include possible explanations for different families of flowers being depicted as day signs. Are the differences in day signs used to indicate certain times periods of the years? Are the differences in day signs used to indicate different people? Is there a specific rotation for the plants being depicted in any given day or year? Are these depictions of flowers, just the artists' personal style, and may not indicate anything more specific? Do the Aztec and Mixtec 260-Day calendars both show variation of the styles of flower day signs depicted? There is currently no research into this subject that can offer an explanation for these questions.

Maguey Glyphs

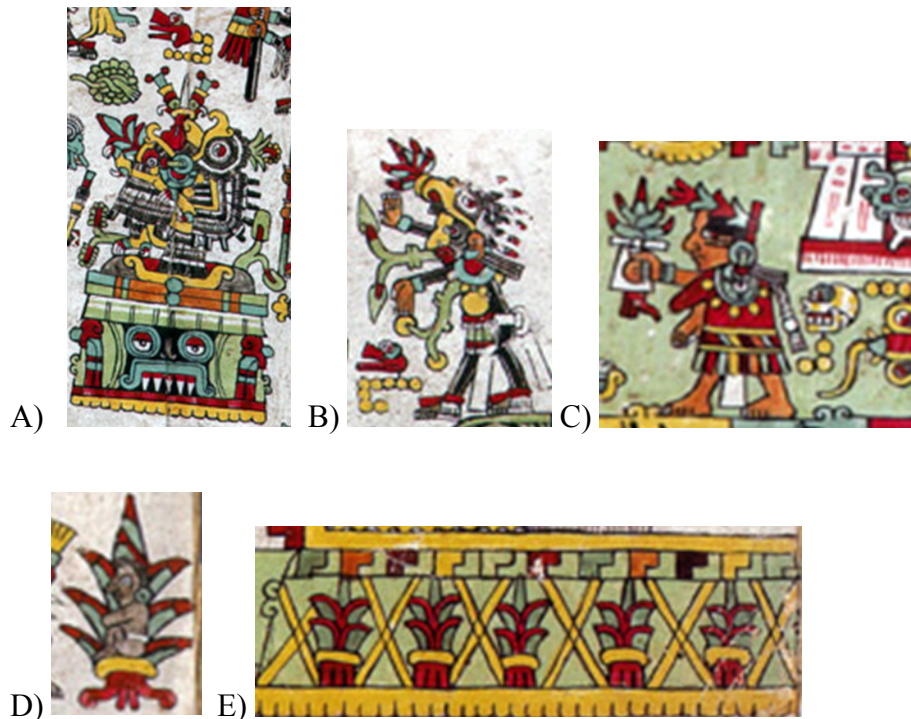


Figure 5: Codex Zouche-Nuttall (obverse) **A)** One Depiction: Lord Eight Wind Page **B)** One Depiction: Lord Eight Wind Page 1 **C)** One Depiction: Lord Six Death Page 19a **D)** One Depiction: Page 22 **E)** One Depiction: Page 38 © The Trustees of the British Museum.

Figure 5 all appear to be depictions of maguey which is a common term in Mesoamerica that describes an Agave plant in general. The differences between the botanical glyphs are minimal when compared to the differences between depictions of the flower day signs. Figures 5.A, 5.B, 5.C, 5.D and 5.E all share the same color scheme but there is variation in the leaf shape, there is some design and size variation, and also the context of the usage of maguey is different in most of the depictions of this plant. The maguey plants in figure 5.A and 5.E both seem to be more obtuse in shape while the maguey plants in 5.B, 5.C, and 5.D seem to be more acute and pointier. Figure 5.C does not have the red outline in its leaves like the other depictions but it still has the tips a red color. Two of the maguey plants are growing out of Lord Eight wind, one maguey plant is used as an offering, one maguey plants has a person sitting in it, and the last maguey depiction seems to be associated with the name of the location.

At the moment the term maguey is not a reference to a certain species of agave but the term more likely is used to describe the genus. The agave genus contains hundreds of variations of Agave species that closely resemble one another. Products derived from the maguey plant, *Agave* spp., were used throughout Mesoamerica; the thorns at the end of the leaves were used in ritual bloodletting ceremonies, while the fibers extracted from the leaves were processed into textiles and ropes. The maguey product that holds the most cultural significance was the alcoholic beverage known as pulque, because it was used prominently by royalty, in many public ceremonies, and for

other ritual occasions. The maguey plant and the alcoholic pulque beverage is depicted in multiple codices from Mexico. Pulque is a drink consumed in ancient Mesoamerica, this drink is prepared from the fermented sap of the agave plant. Depending on which group of people being studied, the pulque beverage can either have a god or goddess, or both associated with it. According to folklore, the Ancient Mesoamerican people from discovered the intoxicating effects of the beverage after watching an opossum extract the sap from the flower stock of an agave plant, which can take up to thirty years to bloom, and as a result the opossum was inebriated (Martineau 2015: 6). The pulque goddess is depicted multiple times in Codex Zouche-Nuttall but she is not seen near any maguey plants.

FUTURE OF ETHNOBOTANY IN CODEX ZOUCHE-NUTTALL

In order for future research to take place, Oaxaca needs to be more environmentally protected, in order to stop the environmental degradation, and to restore some of the diminishing forests. Without the vegetation in Oaxaca, it would be nearly impossible to learn more about the cosmological importance of plants to Mixtec and their uses in ceremonies and rituals. In addition, political action must take place in order to improve the socio-economic conditions of the indigenous people's lives, because no person should have to succumb to working for the cartel just to make ends meet for their family. It is impossible to preserve the past if you can't protect the present culture. That is why before conducting future research on the Mixtec civilization, the problems that the modern indigenous people from Oaxaca face must first be addressed since these are the descendants that carry on the traditions of the past.

Without paleoethnobotanical analysis at Mixtec sites to confirm plant species in a scientific manner, then the identification of these plants will merely be educated speculation. There needs to be archeological evidence for any claims made about vegetation depicted in iconography because of the amount of stylistic variation between artists, it will be impossible to confirm a species. These botanical glyphs depicted in Codex Zouche-Nuttall can probably be correctly reduced to the genus of the plants based off of color and plant structure, but that wouldn't be enough information to confidently identify a particular species. Paleoethnobotanical analysis is limited to just being able to identify exactly what plants were being processed and used but it does not indicate exactly how the plants were being used. Another limitation to paleoethnobotanical research, is that vegetation decays fairly quickly in the archeological records, so the micro- and macro- botanical remains found at an archeological site will not encompass all the plants that belonged to the Ancient Mixtec People.

Future research will include paleoethnobotanical work in various Mixtec sites throughout the Mixteca Alta, Mixteca Baja, and in the Mixteca de la Costa, because all three regions in the La Mixteca have differing climates, altitudes, and vegetation. There needs to be ethnographic work in the modern Mixtec communities in Oaxaca to see if any of the plants depicted are still being used, and how they are being used. The ethnographic work will include interviewing medicine men/women, shamans, farmers, and artists to encompass the significance of the plants across the entire society. The practical applications of plants can definitely be learned with ethnographic evidence of the modern societies, but hopefully the cosmological associations with plants is knowledge that is still being shared and passed down to the newer generations of the society. Codex

Zouche-Nuttall still has a wealth of ethnobotanical information that has yet to be uncovered. The task will require years of research, so as soon as the threat of the cartels of Mexico becomes diminished, researchers then can begin interviewing for primary ethnographic research and the researchers can also begin collecting paleoethnobotanical data from excavations. Until then, further work needs to be done to break down and conduct structural analysis on every single iconographic image in Codex Zouche-Nuttall and then compare those images to other botanical glyphs in the other Mixtec codices. I plan to undergo this research for my Ph.D. dissertation, and if conditions are still not feasible to conduct research in Mexico, then I will expand the ethnobotany of the Mixtec People, both ancient and modern, as Post-Graduate research.

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